BLM LIBRARY
88070299
7100.1
So

SOIL INVENTORY

ROSEBURG BLM DISTRICT

THIS REPORT WAS PREPARED AS GUIDELINES FOR BUREAU OF LAND MANAGEMENT RESOURCE MANAGERS JAN. 77

ANDREWS 76

#3780480

1D88070299

S
599
.07
R67
1977
c.3

TABLE OF CONTENTS

		Page
I.	INTRODUCTION	1
II.	METHODS AND USE OF THIS REPORT	3
III.	GENERAL NATURE OF THE ROSEBURG DISTRICT	25
	A. Climate	25
	B. Geology and Geomorphology	28
	1. Coast Range	28
	2. Klamath Mountains	34
	3. Western Cascade Mountains	37
	4. Geologic Materials and Associated Soils	40
	C. General Soil Map and Vegetation	42
	1. Digger-Jason-Preacher Association	45
	2. Honeygrove-Peavine-Preacher Association	45
	3. Honeygrove-Shivigny Association	46
	4. Klickitat-Harrington Association	46
	5. Holderman-Winberry Association	47
	6. Atring-Bateman-Renhaven Association	47
	7. Jory-Renhaven Association	47
	8. Pollard-McGinnis-Beekman Association	48
	9. Beekman-Vermisa Association	48
	10. Pearsoll-Cornutt Association	49
	11. Holland-Lettia-Siskiyou Association	49
	12. Lettia-Holland Association	50
	13. Freezner-Vena Association	50
	14. Freezner-Chamate-Shippa Association	51
	D. Genetic Key to the Soil Series	52
IV.	DESCRIPTION OF SOIL SERIES AND MAPPING UNITS	59
	Small Granite Pocket	63
	Rock Land	64
	Mixed Alluvial Land (1)	65
	Blachly Series (10)	67
	Jory Series (12)	72
	Bellpine Series (13)	83
	Honeygrove Series (14)	87
	Cruiser Series (19)	96
	Peavine Series (20)	100
	Nekia Series (23)	104
	Ritner Series (24)	109
	Harrington Series (29)	113
	Kilchis Series (35)	117
	Witzel Series (36)	121

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

TABLE OF CONTENTS

	Page
Apt Series (50)	125
Twindar Series (53)	129
Preacher Series (57)	133
Jason Series (64)	142
Digger Series (66)	147
Zango Series (70)	152
Shivigny Series (300)	156
Klickitat Series (323)	159
Abegg Series (360)	165
Chamate Series (362)	169
Kanid Series (370)	173
Beekman Series (371)	178
Vermisa Series (372)	191
Pollard Series (380)	197
McGinnis Series (381)	206
Tishar Series (382)	211
Larmine Series (393)	217
Atring Series (394)	223
Renhaven Series (395)	231
Bateman Series (396)	240
Darby Series (397)	249
Holderman Series (400)	254
Winberry Series (410)	259
Umpcoos Series (564)	262
Siskiyou Series (721)	265
Holland Series (722)	271
Barron Series (723)	279
Lettia Series (724)	283
Vena Series (731)	289
Shippa Series (732)	293
Freezner Series (741)	296
Selmac Series (743)	301
Pearsoll Series (770)	304
Cornutt Series (771)	308
Jayar Series (824)	312
Skymor Series (825)	315
V. SOIL PROPERTIES AND QUALITIES	318
A. Physical Properties	318
B. Chemical Properties	318
C. Engineering Properties and Classifications	318
VI. SOIL USE AND MANAGEMENT	332
A. Site Index	332
B. Regeneration Hazard	332

TABLE OF CONTENTS

		Page
C.	Compaction Hazard	337
D.	Naturally Occurring Ceanothus Species	337
E.	Erosion	338
	1. Surface Erosion	338
	2. Mass Movement	341
F.	Harvesting	343
G.	Slash Burning	344
H.	Fertilizer Practices on Forests	345
	1. Fertilizers	345
I.	Reforestation	349
J.	Recreation	353
	1. Camp Areas	353
	2. Picnic Areas	354
	3. Paths and Trails	361
	4. Septic Tank Drainfield	362
K.	Selected Soil Properties and Qualities	363
	1. Soil Depth	363
	2. Permeability	363
	3. Drainage Class	364
	4. Precipitation	368
	5. Reaction Range	368
	6. Hydrologic Soil Groups	368
	7. Available Water Holding Capacity	369
VII.	SOIL CLASSIFICATION AND MORPHOLOGY	370
A.	Soil Classification	370
B.	Description of Soil Series by Subgroups	370
	Subgroups of Alfisols	370
	Subgroups of Inceptisols	374
	Subgroups of Mollisols	376
	Subgroups of Utisols	377
C.	Detailed Soil Series Descriptions	377
	Blachly Series (10)	378
	Jory Series (12)	379
	Bellpine Series (13)	380

TABLE OF CONTENTS

	Page
Honeygrove Series (14)	381
Cruiser Series (19)	382
Peavine Series (20)	383
Nekia Series (23)	383
Ritner Series (24)	384
Harrington Series (29)	385
Kilchis Series (35)	387
Witzel Series (36)	388
Apt Series (50)	388
Twindar Series (53)	390
Preacher Series (57)	392
Jason Series (64)	393
Digger Series (66)	395
Zango Series (70)	395
Shivigny Series (300)	397
Klickitat Series (323)	400
Abegg Series (360)	401
Chamate Series (362)	402
Kanid Series (370)	404
Beekman Series (371)	406
Vermisa Series (372)	407
Pollard Series (380)	409
McGinnis Series (381)	410
Tishar Series (382)	412
Larmine Series (393)	414
Atring Series (394)	416
Renhaven Series (395)	418
Bateman Series (396)	421
Darby Series (397)	423
Holderman Series (400)	425
Winberry Series (410)	426
Umpcoos Series (564)	427
Siskiyou Series (721)	427
Holland Series (722)	428
Barron Series (723)	429
Lettia Series (724)	430
Vena Series (731)	433
Shippa Series (732)	433
Freezner Series (741)	435
Selmac Series (743)	436
Pearsoll Series (770)	438
Cornutt Series (771)	438
Jayar Series (824)	439
Skymor Series (825)	441
VIII. APPENDIX I Detailed Site Index Data	443-455
IX. LITERATURE CITED	456
X. ROSEBURG SOIL MAPS	460

List of Figures

Figure No.	Title	Page
1	Location of the Roseburg District	1
2	Rainfall Map of Roseburg District	26
3	General Geology Map of Roseburg District	29-30
4	Block Diagram of Type I Tyee Sandstone	33
5	Block Diagram of Type II Tyee Sandstone	35
6	Block Diagram of Granitic Landscape	38
7	General Soil Map of Roseburg District	43-44
8	Rock Land - Larmine Soil Association	64
9	Blachly Soil Series and Young Douglas-Fir Stand	66
10	Leaf Structure of *Ceanothus velutinus*	75
11	Growth of Douglas-Fir in Stand of *Ceanothus velutinus*	75
12	Soil Compaction on Honeygrove Series	89
13	Grass and Poison Oak Invasion on Ritner and Darby Series	111
14	Young Stand on Kilchis Series	119
15	Old Clearcut in Witzel and Ritner Series	123
16	Gravelly Overlay Phase of Twindar Series	132
17	Commercially Thinned Stand on Preacher Series	135
18	Landscape of Preacher and Digger Series	135
19	Debris Avalanche on Jason Series	145
20	Profile of Zango Soil	152
21	Landscape of Klickitat Series	160
22	Slope Failure on Klickitat Series	162
23	Sidecast Failure in Klickitat Series	162
24	Columns of Welded Tuff	170
25	Index to Roseburg Soil Maps (Includes maps)	460

List of Figures

Figure No.	Title	Page
25	Weathering of Welded Tuff	170
26	Parent Material of Chamate Series	170
27	Artificial Shade	179
28	Canyon Live Oak - Douglas-Fir Stand on Vermisa Series	193
29	Low Stocking on Vermisa Series	193
30	New Clearcut on Pollard Series	199
31	Young Stand on McGinnis Series	208
32	Berm to Prevent Sidecast Material from Spilling Downslope	220
33	Landscape of Atring Series	224
34	Helipond	243
35	Profile of Darby Series	249
36	Spalling of Granite	268
37	Headwalls in Siskiyou and Holland Series	268
38	Landscape of Holland and Siskiyou Series	273
39	Erosive Sidecast Material from Granite Soils	273
40	Ditchline Erosion in Granite Soils	273
41	Small Slide in Granite Soils	274
42	Cut Bank Failures in Lettia Series	284
43	Vegetation on Pearsoll Series	305
44	Sag Pond	340
45	Berm to Aid in End Hauling	342
46	Graph of Affect Nitrogen Fertilizer Has on Tree Growth	346
47	Aerial Application of Prill Fertilizer	347
48	Graph of Water Holding Capacity and Seedling Survival	352

List of Tables

Table No.	Title	Page
1	Acres and Proportionate Extent of Each Soil Phase by Area and for the Entire Roseburg District	6-23
2	Means and Extremes in Weather for Roseburg Weather Station	27
3	Geologic Formations in the Coast Range	31
4	Geologic Formations in the Klamath Mountains	36
5	Geologic Formations in the Western Cascade Mountains	39
6	Geologic Materials and Associated Soils	41
7	Genetic Key to the Soil Series	53-58
8	Soil Series and Miscellaneous Land Types and Their Respective Map Symbols	60
9	Definitions of Slope Gradient, Slope Aspect and Soil Depth Classes	61
10	Percentage of Soil Series in the District	62
11	Physical Properties of Selected Soils	319-321
12	Chemical Properties of Selected Soils	322-324
13	Engineering Properties and Classification of Soils	325-327
14	Forest Management Measurements and Interpretations	333-336
15	Relation of Site Classes to Ranges in Site Index Ratings	332
16	Sediment Production from Sandy Soils over Granite Due to Surface Erosion on Roads	338
17	The Affect of Nitrogen Fertilizer on the Increase in Site Index for Five Different Natural Site Indices	348
18	Factors Affecting Regeneration Success	350
19	Soil Interpretations for Recreational Uses of the Soils	355-360
20	Selected Soil Properties and Qualities	365-367
21	Classification of the Soil Series	371-373
Appendix 1	Detailed Site Index Data	443-455

Acknowledgement

Our thanks are extended to the Soil Conservation Service for its helpful comments on field reviews and for its speedy correlation work. Appreciation is due Dr. Jerry Simonson, Oregon State University, for his help on field reviews and analyses of soil samples.

The efficient typing and proofing done by the Roseburg, Bureau of Land Management secretaries is greatly appreciated.

Typed by: Kathy Wilmot and Barbara Feezel

SOIL INVENTORY OF THE ROSEBURG DISTRICT

by

Stephen R. Wert, James A. Pomerening, T. Scott Gibson and Byron R. Thomas[1]

I. INTRODUCTION

This soils report contains interpretations of technical and scientific data useful for making land management decisions. It was made to provide information about the soil and vegetation resources and to evaluate the potential and limitation of these resources. This report consists of a soil association map, descriptions of mapping units and soil behavior, detailed descriptions of individual soil series and tables of interpretations for soils in the Roseburg District.

This soils inventory was conducted to locate soils and identify their response to resource management. For example, the soil association map and detailed interpretations and descriptions will assist foresters in timber sale layouts, silvicultural practices and harvesting methods. It will help engineers in selecting sites for stable roads and will aid resource specialists in determining the suitability of sites for water reservoirs, timber production or campgrounds. It also provides basic soil information for the Bureau's planning system. The general soil map and information about the climate, geology and land forms of the area will be most useful for large-scale planning.

This inventory will facilitate planning research on soils, vegetation and watershed problem areas. It will aid in the application of the results of research to different parts of the District. Research results from any sample area of one soil can be extended with confidence to all other areas of that soil. The report, in general, will add to the fund of knowledge about the environmental conditions of the District.

Three natural resources - soil, vegetation and water - are all interrelated and can be expected to last indefinitely if properly managed. Soil is renewable only over a long period of time and is the most critical resource. Proper management, therefore, entails a very long-range planning period and an understanding of the interactions among all resources. Ideally, proper management of the resources is aimed at maximizing economic returns without adverse impact on any resource or on environmental quality. Meeting this goal is extremely difficult because of (1) the short-range view of many users, (2) the general lack of knowledge of the interactions among the resources and (3) differences in immediate economic returns among the various competing uses of the same resource.

---

[1]Roseburg District Soil Scientist, Bureau of Land Management; Temporary Soil Scientist, Bureau of Land Management; Temporary Soil Scientist, Bureau of Land Management; and Oregon State Office Soil Scientist, Bureau of Land Management, respectively.

The inventory area is in southwest Oregon. It falls almost entirely within Douglas County with fewer than 300 acres in Lane County. The total area of the inventory is 789,178 acres with 407,131 acres in BLM ownership. The remaining 382,047 acres are private, State or County owned lands.

Figure 1 shows the location of the Roseburg District. The city of Roseburg is located about in the middle of the District. Roseburg is 70 miles south of Eugene and 95 miles north of Medford.

Figure 1. Location of the Roseburg District

II. METHODS AND USE OF THIS REPORT

This inventory was made in an area where a system of roads has been developed. The cutbacks along these roads were the principal exposures of soil profiles used in examining the soil. Where roads did not cross large blocks of land, transects were made with a soil auger. Soil physical characteristics were recorded and notations were made of shape and gradient of slopes, drainage dissection pattern of the watersheds, kinds and amounts of native vegetation and kinds and nature of the parent rock. A soil map having a scale of 1:62,500 was compiled on 15-minute topographic maps using the additional aids of aerial photographs, a stereoscope and other available data on geology, relief, vegetation and climate. Most mapping units are slope gradient phases of soil associations consisting of two or three dominant soil series.

Representative sample areas were selected for each mapping unit to determine the kinds of soils and their distribution, extent and slope position. These sample areas were concentrated on BLM-administered lands. They were large enough to be representative and to disclose the pattern of soils in the mapping unit. Each sample area consisted of a two- to five-mile section of road depending on the size of the delineations and the location of roads. Inspection of the soil profile and rock strata was made at one-tenth and one-twentieth mile intervals along the roads. Identification of soils at these intervals, together with environmental features, served to provide the approximate percentage of individual soil series in the mapping units.

The soil map shows the location and extent of the important soil series and the dominant slopes within each delineation. It does not identify the soil series or slope at any one particular spot on the landscape. The soils were classified according to standard criteria used in the soil taxonomy of the National Cooperative Soil Survey (Soil Survey Staff, 1970). As in most classification systems, the soil classification system has different levels of generalization. The lowest category (least generalized) is the soil series. In this inventory each series is identified by a name and a number, such as Kanid (370). Traditionally, soil series are generally given names that are taken from geographic features occurring near the area where the soil was first mapped. For example, the Shivigny (300) series was named after Shivigny Mountain. Other soil series names are simply coined names given by the soil scientist. The process of assigning official names to the soil series is administered by the Soil Conservation Service, U.S.D.A. Soil series names used in this report have been correlated by the Soil Conservation Service.

A soil series is comprised of soils with profiles almost alike. All soils of a series are similar with respect to kind, thickness and arrangement of horizons; and also in terms of the structure, color, texture and other important characteristics of each horizon. The soils

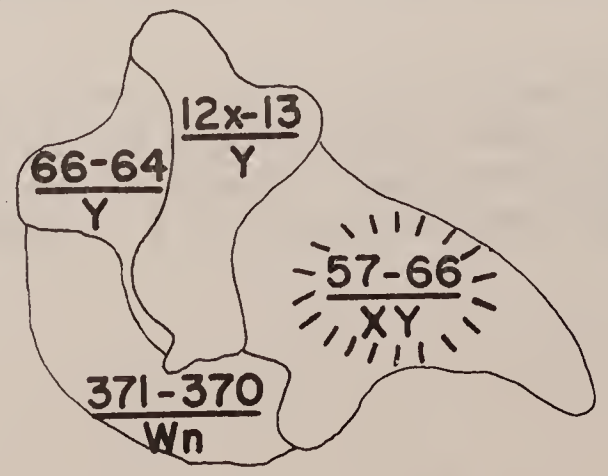
of a series are all developed from a parent material that is similar with respect to texture and mineralogy, and under similar conditions of climate, vegetation, topography and time.

The area was mapped by delineating soil associations. With a few exceptions, individual soil series were not delineated on the map. This type of mapping was done because the soil series change over such short distances that it was not possible to accurately delineate each one on the 1:62,500 base maps. A soil association is a parcel of land that has a distinctive proportional pattern of two or more soil series that individually occur in areas too small to delineate separately. An association is named for the one, two, or three most abundant soils making up collectively at least 80 percent of the area. Soils occupying less than 20 percent of the area are called inclusions, and though not mentioned in the name of the association, they are described according to their setting and proportionate extent in the mapping unit descriptions. It is important to recognize and identify these inclusions in the field because they may actually be the major soils of a small management unit or timber harvest unit that occurs within a large delineation on the soil map.

The soils series that are mapped together in associations are consistent in where they occur on the landscape. For example, the Honeygrove-Peavine association occurs on gentle topography in the Drain area. The association is found on broad ridgetops and large slump blocks. Within this type of topography, the Honeygrove soil is found on the flatter portions, and the Peavine soils are found on short, steep slopes of up to 45 percent.

Using soil associations for soil survey purposes results in large delineations. Thus, these soil association maps are usually better suited for broad-type planning than for detailed operational purposes. However, detailed information about soil properties, and soil use and behavior is included in this report. Therefore, when a particular kind of soil from a soil association has been identified in the field, this inventory contains the necessary information for making detailed soil use and management recommendations.

Below is an example of a delineation and a soil association symbol as they occur on the soil map. The symbol, $\frac{57\text{-}66}{XY}$. identifies a mapping unit. The top part of the symbol tells what soil series make up the mapping unit and the bottom part gives the dominant slope class or classes. In this case, the major soil is Preacher (57) and the secondary soil is Digger (66). These two soils occur on slopes that



are predominantly between 35 to 65 percent, indicated by the letter X, although about 30 percent of them are 65 to 90 percent, indicated by the letter Y.

A list of the soils and their map symbols is shown in Table 1, along with the acreage and percentage of each soil phase by Resource Area and for the entire District. Private land interspersed with the publicly administered land was mapped in this inventory. The data in Table I are separated according to type of ownership.

Phases of soil series refer to differences in soil characteristics that affect the use management of the soil but that do not affect the genesis of the soil Slope gradient, slope aspect, and kind of underlying rock type are examples of soil properties used to define phases of soil series in this report. These phase criteria are particularly significant to soil productivity, forest regeneration, erosion hazard and hillside stability.

The symbols, $\frac{380\text{-}382}{WXn}$ and $\frac{380\text{-}382}{Wx}$, are two phases of the 380-382 soil association. Soils of the Pollard (380) series are the most abundant kind of soil in this association. Soils of the Tishar (382) series are of secondary importance but make up at least 20 percent of the area. The W and X refer to the slope gradients of 10 to 35 percent and 35 to 65 percent, respectively. If the slopes mainly range from 10 to 65 percent, the combined symbol WX is used. The small letter "n" in association with the slope gradient symbol designates a northerly aspect, making it a separate phase of the soil association. The absence of "n" defines the area as having a southerly aspect. Substrata phase symbols associated with the soil series symbols are: "m" for metavolcanic rocks; "t" for tuffaceous rocks; and "x" for sedimentary rocks. The letter "s" in the symbol 53s designates a gravelly overlay phase of the Twindar series.

Some areas of land are dominated by exposed bedrock, or have surface layers so shallow they scarcely can be called soils. Other areas of land occur along stream channels where small bodies of several kinds of soil and raw sediments are in a complex mixture. These two areas are called miscellaneous land types and are shown on the soil map in the same way as other mapping units with the descriptive names of Rock Land (R) and Mixed Alluvial Land (1). Another miscellaneous land type is small pockets of decomposed granite. They are shown on the soil map with a dotted pattern. These small pockets contain a mixture of Siskiyou, Holland, and Barron soils.

To make this report and map more useful and practical, detailed mapping unit descriptions are given in Section IV. They describe the physiographic position where each soil series occurs within each association. Transects were made of the mapping units to determine the percentage of each series and slope phase in each mapping unit. The percentage

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
1/V	Mixed Alluvial Land, 0 to 10% slopes	303 (0.26)	5229 (4.45)	151 (0.17)	2460 (2.11)	484 (0.45)	348 (0.42)	348 (0.37)	1282 (1.98)	1286 (0.32)	9319 (2.44)
10/W	Blachly sicl, 10 to 35% slopes							1870 (2.01)	920 (1.42)	1870 (0.46)	920 (0.24)
10/X	Blachly sicl, 35 to 65% slopes							650 (0.70)	434 (0.67)	650 (0.16)	434 (0.11)
12/W	Jory sicl, 0 to 10% slopes		34 (0.03)								34 (0.03)
12/X	Jory sicl, 10 to 35% slopes	3597 (3.04)	3939 (3.36)							3579 (0.89)	3939 (1.03)
12t/X	Jory sicl, tuffaceous substratum 10 to 35% slopes	262 (0.22)	64 (0.05)					112 (0.12)	129 (0.20)	374 (0.09)	193 (0.05)
12t/X	Jory sicl, tuffaceous substratum 35 to 65% slopes	112 (0.09)	27 (0.02)					48 (0.05)	55 (0.09)	160 (0.04)	82 (0.02)
12x/V	Jory sicl, sedimentary rock substratum 10 to 35% slopes	76 (0.06)	392 (0.33)	970 (1.10)	1172 (1.01)					1046 (0.26)	1564 (0.41)
12x/W	Jory sicl, sedimentary rock substratum 10 to 35% slopes, southerly aspect	7440 (6.29)	9225 (7.83)	2403 (2.73)	2557 (2.19)			248 (0.27)	13 (0.02)	10091 (2.48)	11795 (3.09)
12x/Wn	Jory sicl, sedimentary rock substratum 10 to 35% slopes, northerly aspect			615 (0.07)	339 (0.29)					615 (0.15)	339 (0.09)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
12x/X	Jory sicl, sedimentary rock substratum, 35 to 65% slopes	990 (0.83)	294 (0.25)	28 (0.03)	79 (0.07)			545 (0.59)	136 (0.21)	1435 (0.35)	416 (0.11)
13/V	Bellpine sicl, 0 to 10% slopes	10 (0.008)	125 (0.11)							10 (0.002)	125 (0.03)
13/X	Bellpine sicl, 10 to 35% slopes	2172 (1.84)	2270 (2.36)					67 (0.07)	107 (0.17)	2239 (0.55)	2877 (0.75)
13/Y	Bellpine sicl, 65 to 90% slopes	19 (0.02)	56 (0.05)							19 (0.005)	56 (0.01)
13t/W	Bellpine sicl, tuffaceous substratum, 35 to 65% slopes	112 (0.09)	27 (0.02)					48 (0.05)	55 (0.09)	160 (0.04)	82 (0.02)
13t/X	Bellpine sicl, tuffaceous substratum, 35 to 65% slopes	48 (0.04)	12 (0.01)					20 (0.02)	24 (0.04)	68 (0.02)	36 (0.01)
14t/V	Honeygrove sicl, tuffaceous substratum, 10 to 35% slopes							710 (0.76)	320 (0.51)	710 (0.17)	320 (0.09)
14t/W	Honeygrove sicl, tuffaceous substratum, 10 to 35% slopes	283 (0.24)	245 (0.21)			1653 (1.53)	50 (0.06)	10006 (10.75)	7054 (10.92)	11942 (2.93)	7349 (1.92)
14t/X	Honeygrove sicl, tuffaceous substratum, 35 to 65% slopes							1730 (1.86)	1246 (1.93)	1730 (0.42)	1246 (0.33)
14x/V	Honeygrove sicl, sedimentary rock substratum, 0 to 10% slopes	1018 (0.86)	434 (037)	246 (0.28)						1264 (0.31)	434 (0.11)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
14x/W	Honeygrove sicl, sedimentary rock substratum, 10 to 35% slopes	3724 (3.15)	2490 (2.12)	669 (0.76)	435 (0.37)					4393 (1.08)	2925 (0.77)
14x/X	Honeygrove sicl, sedimentary rock substratum, 35 to 65% slopes	1686 (1.43)	896 (0.76)	405 (0.46)	163 (0.14)					2091 (0.51)	1059 (0.28)
14x/Y	Honeygrove sicl, sedimentary rock substratum, 65 to 90% slopes	17 (0.01)	23 (0.02)							17 (0.004)	23 (0.006)
19/X	Cruiser gr. l., 35 to 65% slopes							1134 (1.22)	301 (0.47)	1134 (0.28)	301 (0.08)
19/Y	Cruiser gr. l., 65 to 90% slopes							139 (0.15)	16 (0.02)	139 (0.03)	16 (0.004)
20t/W	Peavine sicl, tuffaceous substratum, 10 to 35% slopes	28 (0.02)	4 (0.003)					1247 (1.34)	865 (1.34)	1275 (0.31)	869 (0.23)
20x/V	Peavine sicl, sedimentary rock substratum, 0 to 10% slopes	678 (0.57)	290 (0.25)	164 (0.19)						842 (0.21)	290 (0.08)
20x/W	Peavine sicl, sedimentary rock substratum, 10 to 35% slopes	1682 (1.42)	1336 (1.14)							1682 (0.41)	1336 (0.35)
20x/X	Peavine sicl, sedimentary rock substratum, 35 to 65% slopes	537 (0.45)	324 (0.28)							537 (0.13)	324 (0.08)
23/V	Nekia cl, 0 to 10% slopes		51 (0.04)								51 (0.01)
23/W	Nekia cl, 10 to 35% slopes	1139 (0.96)	1379 (1.17)							1139 (0.28)	1379 (0.36)
23/X	Nekia cl 35.to 65% slopes	182 (0.15)	274 (0.23)							182 (0.04)	274 (0.07)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
23/Y	Nekia cl, 65 to 90% slopes	13 (0.01)	25 (0.02)							13 (0.003)	25 (0.007)
24/W	Ritner gr. sicl, 10 to 35% slopes	124 (0.10)	88 (0.07)					68 (0.07)	234 (0.36)	192 (0.05)	322 (.08)
24/X	Ritner gr. sicl, 35 to 65% slopes	50 (0.04)	48 (0.04)					65 (0.07)	102 (0.16)	115 (0.03)	150 (0.04)
24/Y	Ritner gr. sicl, 65 to 90% slopes	340 (0.29)	395 (0.34)					284 (0.31)	360 (0.56)	624 (0.15)	755 (0.20)
29/W	Harrington v. gr. cl, 10 to 35% slopes							695 (0.75)	738 (1.14)	695 (0.17)	738 (0.19))
29/X	Harrington v.gr. cl, 35 to 65% slopes	84 (0.07)						1701 (1.83)	1256 (1.94)	1786 (0.44)	1256 (0.33)
29/Y	Harrington v. gr. cl, 65 to 90% slopes southerly aspect	32 (0.29)						5326 (5.72)	2929 (4.53)	5358 (1.32)	2929 (0.77)
29/Yn	Harrington v. gr. cl, 65 to 90% slopes northerly aspect							601 (0.65)	458 (0.71)	601 (0.15)	458 (0.12)
35/X	Kilchis st. l., 35 to 65% slopes							511 (0.55)	188 (0.29)	511 (0.13)	188 (0.05)
35/Y	Kilchis st. l., 65 to 90% slopes southerly aspect	21 (0.02)						3198 (3.44)	1621 (2.51)	3219 (0.79)	1621 (0.42)
35/Yn	Kilchis st. l., 65 to 90% slopes northerly aspect							401 (0.43)	306 (0,47)	401 (0.10)	306 (0.08)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
36/X	Witzel v. cob. cl, 35 to 65% slopes	84 (0.07)	123 (0.10)					705 (0.76)	587 (0.91)	789 (0.19)	710 (0.19)
36/Y	Witzel v. cob. cl, 65 to 90% slopes	236 (0.20)	279 (0.24)					189 (0.20)	240 (0.37)	425 (0.10)	519 (0.14)
50/W	Apt. cl, 10 to 35% slopes	204 (0.17)	154 (0.13)					1072 (1.15)	846 (1.31)	1276 (0.31)	1000 (0.26)
50/X	Apt. cl, 35 to 65% slopes	1734 (1.47)	967 (0.82)					148 (0.16)	139 (0.22)	1882 (0.46)	1106 (0.29)
50/Y	Apt. cl, 65 to 90% slopes	1288 (1.09)	863 (0.73)							1288 (0.32)	863 (0.23)
53/X	Twindar vgr. l., 35 to 65% slopes							245 (0.26)	135 (0.21)	245 (0.06)	135 (0.04)
53/Y	Twindar vgr. l., 65 to 90% slopes							3146 (3.38)	1150 (1.78)	3146 (0.77)	1150 (0.30)
53s/Y	Twindar gr. overlay, 65 to 90% slopes southerly aspect							361 (0.39)	243 (0.38)	361 (0.09)	243 (0.06)
53s/Yn	Twindar gr. overlay, 65 to 90% slopes northerly aspect							44 (0.05)	30 (0.05)	44 (0.01)	30 (0.008)
57/W	Preacher cl, 10 to 35% slopes	658 (0.56)	184 (0.16)	551 (0.63)	402 (.34)					1209 (0.30)	586 (0.15)
57/X	Preacher cl, 35 to 65% slopes	6885 (5.82)	4204 (3.57)	1149 (1.31)	575 (0.49)					8034 (1.97)	4779 (1.25)
57/Y	Preacher cl, 65 to 90% slopes	1298 (1.10)	879 (0.75)	235 (0.27)	143 (0.12)					1533 (0.38)	1022 (0.27)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
64/X	Jason vgr. l., 35 to 65% slopes	2058 (1.74)	1198 (1.02)							2058 (0.51)	1198 (0.31)
64/Y	Jason vgr. l., 65 to 90% slopes southerly aspect	9499 (8.04)	6316 (5.37)	336 (0.38)	329 (0.28)	371 (0.34)				10206 (2.51)	6645 (1.74)
64/Yn	Jason vgr. l., 65 to 90% slopes northerly aspect					209 (0.19)	257 (0.31)			209 (0.05)	257 (0.07)
66/W	Digger gr. l., 10 to 35% slopes			92 (0.10)	80 (0.07)					92 (0.02)	80 (0.02)
66/X	Digger gr. l., 35 to 65% slopes	5391 (4.56)	3769 (3.20)	275 (0.31)	178 (0.15)					5666 (1.39)	3947 (1.03)
66/Y	Digger gr. l., 65 to 90% slopes southerly aspect	10526 (8.91)	7570 (6.44)	663 (0.75)	616 (0.53)	865 (0.80)				12054 (2.96)	8186 (2.14)
66/Yn	Digger gr. l., 65 to 90% slopes northerly aspect					486 (0.45)	598 (0.72)			486 (0.12)	598 (0.16)
70/Y	Zango vgr. sl, 65 to 90% slopes southerly aspect							2409 (2.59)	868 (1.34)	2409 (0.59)	868 (0.23)
70/Yn	Zango vgr. sl, 65 to 90% slopes northerly aspect							99 (0.11)	67 (0.10)	99 (0.02)	67 (0.02)
300/V	Shivigny gr. l., 0 to 35% slopes							304 (0.33)	141 (0.22)	304 (0.07)	141 (0.04)
300/W	Shivigny gr. l., 35 to 65% slopes						708 (0.85)	3753 (4.03)	2610 (4.04)	3753 (0.92)	3318 (0.87)
300/X	Shivigny gr. l., 65 to 90% slopes							1552 (1.67)	1119 (1.73)	1552 (0.38)	1119 (0.29)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
323/W	Klickitat gr. l., 10 to 35% slopes							735 (0.79)	271 (0.42)	735 (0.18)	271 (0.07)
323/X	Klickitat gr. l., 35 to 65% slopes	200 (0.17)						2621 (2.82)	2102 (3.25)	2821 (0.69)	2102 (0.55)
323/Y	Klickitat gr. l., 65 to 90% slopes							3285 (3.53)	1682 (2.60)	3285 (0.81)	1682 (0.44)
360/X	Abegg gr. l., 35 to 65% slopes southerly aspect					371 (0.34)	321 (0.39)			371 (0.09)	321 (0.08)
360/Xn	Abegg gr. l., 35 to 65% slopes northerly aspect					350 (0.32)	62 (0.07)	93 (0.10)	25 (0.04)	443 (0.11)	87 (0.02)
360/Y	Abegg gr. l., 65 to 90% slopes southerly aspect					1329 (1.23)	2257 (2.71)	428 (0.46)	608 (0.94)	1757 (0.43)	2865 (0.75
360/Yn	Abegg gr. l., 65 to 90% slopes northerly aspect					577 (0.53)	573 (0.69)			577 (0.14)	573 (0.15)
362/V	Chamate vgr. l., 0 to 10% slopes							167 (0.04)	96 (0.15)	167 (0.04)	96 (0.03)
362/W	Chamate vgr. l., 10 to 35% slopes							1426 (1.53)	1637 (2.53)	1426 (0.35)	1637 (0.43)
362/X	Chamate vgr. l., 35 to 65% slopes							647 (0.69)	1180 (1.83)	647 (0.16)	1180 (0.31)
362/Y	Chamate vgr. l., 65 to 90% slopes							505 (0.54)	224 (0.35)	505 (0.12)	224 (0.06)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
370/W	Kanid gr. l., 10 to 35% slopes southerly aspect			132 (0.15)	739 (0.63)	543 (0.50)	1009 (1.21)	166 (0.18)	181 (0.28)	841 (0.21)	1929 (0.50)
370/Wn	Kanid gr. l., 10 to 35% slopes northerly aspect			484 (0.55)	706 (0.61)					484 (0.12)	706 (0.18)
370/X	Kanid gr. l., 35 to 65% slopes southerly aspect			2248 (2.55)	3345 (2.87)	4272 (3.96)	4572 (5.49)			6520 (1.60)	7917 (2.07)
370/Xn	Kanid gr. l., 35 to 65% slopes northerly aspect			472 (0.54)	750 (0.64)	169 (0.16)	1024 (1.23)			641 (0.16)	1774 (0.46)
370/Y	Kanid gr. l., 65 to 90% slopes southerly aspect			84 (0.10)	408 (0.35)	2723 (2.52)	1580 (1.90)	302 (0.32)	181 (0.28)	3109 (0.76)	2169 (0.57)
370/Yn	Kanid gr. l., 65 to 90% slopes northerly aspect			146 (0.17)	178 (0.15)	471 (0.44)	346 (0.42)			617 (0.15)	524 (0.14)
371/V	Beekman vgr. l., 0 to 10% slopes			57 (0.06)	133 (0.11)					57 (0.01)	133 (0.03)
371/W	Beekman vgr. l., 10 to 35% slopes southerly aspect			715 (0.81)	1848 (0.28)	362 (0.34)	673 (0.81)	111 (0.12)	121 (0.19)	1188 (0.29)	2642 (0.69)
371/Wn	Beekman vgr. l., 10 to 35% slopes northerly aspect			981 (1.11)	1078 (0.92)					981 (0.24)	1078 (0.28)
371/X	Beekman vgr. l., 35 to 65% slopes southerly aspect			6666 (7.58)	9290 (7.97)	5401 (0.34)	4852 (5.82)			12067 (2.96)	14142 (3.70)
371/Xn	Beekman vgr. l., 35 to 65% slopes northerly aspect			2786 (3.17)	4219 (3.62)	741 (0.69)	1349 (1.62)			3527 (0.87)	5568 (1.46)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
371/Y	Beekman vgr. l., 65 to 90% slopes southerly aspect			8894 (10.11)	10507 (9.01)	11947 (11.07)	8121 (9.75)	101 (0.11)	121 (0.19)	20942 (5.14)	18749 (4.91)
371/Yn	Beekman vgr. l., 65 to 90% slopes northerly aspect			3417 (3.88)	4437 (3.81)	3663 (3.39)	2674 (3.21)			7080 (1.74)	7111 (1.86)
372/W	Vermisa vgr. l., 10 to 35% slopes southerly aspect			5 (0.006)	43					5 (0.001)	43 (0.01)
372/Wn	Vermisa vgr. l., 10 to 35% slopes northerly aspect			184 (0.21)	220 (0.04)					184 (0.05)	220 (0.06)
372/X	Vermisa vgr. l., 35 to 65% slopes southerly aspect			1141 (1.30)	1767 (1.52)	565 (0.52)	317 (0.38)			1706 (0.42)	2084 (0.55)
372/Xn	Vermisa vgr. l., 35 to 65% slopes northerly aspect			1337 (1.52)	1785 (1.53)	251 (0.23)	225 (0.27)			1588 (0.39)	2010 (0.53)
372/Y	Vermisa vgr. l., 65 to 90% slopes southerly aspect			9505 (10.80)	11391 (9.77)	9192 (8.52)	6604 (7.93)			18697 (4.59)	17995 (4.71)
372/Yn	Vermisa vgr. l., 65 to 90% slopes northerly aspect			2592 (2.95)	3058 (2.62)	2812 (2.61)	2020 (2.42)			5404 (1.33)	5078 (1.33)
380/V	Pollard sicl, 0 to 10% slopes			1308 (1.49)	2359 (2.02)					1308 (0.32)	2359 (0.62)
380/W	Pollard sicl, 10 to 35% slopes southerly aspect			4801 (5.46)	6095 (5.23)	477 (0.44)	574 (0.69)			5278 (1.30)	6669 (1.75)
380/Wn	Pollard sicl, 10 to 35% slopes northerly aspect			1514 (1.72)	1768 (1.52)	748 (0.69)	761 (0.91)			2262 (0.56)	2529 (0.66)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
380/X	Pollard sicl, 35 to 65% slopes southerly aspect			2407 (2,74)	3216 (2.75)	408 (0,38)	420 (0.50)	489 (0,53)	609 (0.94)	3304 (0.81)	4245 (1.11)
380/Xn	Pollard sicl, 35 to 65% slopes northerly aspect			1416 (1.61)	2556 (2.19)			62 (0.07)	62 (0.10)	1478 (0.36)	2618 (0.69)
380/Y	Pollard sicl, 65 to 90% slopes southerly aspect			32 (0.04)	23 (0.02)	111 (0.10)	90 (0.11)			143 (0.04)	113 (0.03)
381/V	McGinnis vgr. cl, 0 to 10% slopes			458 (0.52)	588 (0.50)					458 (0.11)	588 (0.15)
381/W	McGinnis vgr. cl, 10 to 35% slopes southerly aspect			2319 (2.64)	2737 (2.35)	1554 (1.44)	1810 (2.17)			3873 (0.95)	4547 (1.19)
381/Wn	McGinnis vgr. cl, 10 to 35% slopes northerly aspect			1246 (1.42)	1418 (1.22)	572 (0.53)	456 (0.55)			1818 (0.45)	1874 (0.49)
381/X	McGinnis vgr. cl, 35 to 65% slopes southerly aspect			2054 (2.33)	2386 (2.05)	3170 (2.94)	2071 (0.49)	210 (0.23)	261 (0.40)	5434 (1.33)	4718 (1.24)
381/Xn	McGinnis vgr. cl, 35 to 65% slopes northerly aspect			1418 (1.61)	2499 (2.14)	474 (0.44)	348 (0.42)	27 (0.03)	27 (0.04)	1919 (0.47)	2874 (0.75)
381/Y	McGinnis vgr. cl, 65 to 90% slopes southerly aspect			170 (0.19)	142 (0.12)	450 (0.42)	308 (0.37)			620 (0.15)	450 (0.12)
381/Yn	McGinnis vgr. cl, 65 to 90% slopes northerly aspect			280 (0.32)	441 (0.38)					280 (0.07)	441 (0.12)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
382/W	Tishar gr. sicl , 10 to 35% slopes southerly aspect			2020 (2.30)	2600 (2.23)	2024 (1.88)	2385 (2.86)			4044 (0.99)	4985 (1.30)
382/Wn	Tishar gr. sicl, 10 to 35% slopes northerly aspect			1229 (1.40)	1293 (1.11)	377 (0.35)	224 (0.27)			1606 (0.39)	1517 (0.40)
382/X	Tishar gr. sicl, 35 to 65% slopes southerly aspect			1375 (1.56)	1619 (1.39)	4548 (4.22)	2906 (3.49)			5923 (1.45)	4525 (1.18)
382/Xn	Tishar gr. sicl, 35 to 65% slopes northerly aspect			852 (0.97)	1302 (1.12)	712 (0.66)	522 (0.63)			1564 (0.38)	1824 (0.48)
382/Yn	Tishar gr. sicl, 65 to 90% slopes northerly aspect			201 (0.23)	322 (0.28)					201 (0.05)	322 (0.08)
393/X	Larmine gr. l., 35 to 65% slopes	2569 (2.17)	5219 (4.44)							2569 (0.63)	5219 (1.37)
393/Y	Larmine gr. l., 65 to 90% slopes	7841 (6.63)	6775 (5.76)					39 (0.04)	304 (0.47)	7880 (1.94)	7079 (1.85)
394/W	Atring gr. l., 10 to 35% slopes	241 (0.20)	296 (0.25)							241 (0.06)	296 (0.08)
394/X	Atring gr. l., 35 to 65% slopes	6820 (5.77)	7153 (6.08)					198 (0.21)	117 (0.18)	7018 (1.72)	7270 (1.90)
394/Y	Atring gr. l., 65 to 90% slopes	8542 (7.23)	7547 (6.42)					74 (0.08)	431 (0.67)	8616 (2.12)	7978 (2.09)
395/V	Renhaven l., 0 to 10% slopes	48 (0.04)	26 (0.02)	895 (1.02)	1743 (1.49)					943 (0.23)	1769 (0.46)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
395/W	Renhaven l., 10 to 35% slopes southerly aspect	4010 (3.39)	6413 (5.45)	2653 (3.01)	3382 (2.90)			125 (0.13)	73 (0.11)	6788 (1.66)	9868 (2.58)
395/Wn	Renhaven l., 10 to 35% slopes northerly aspect			475 (0.54)	289 (0.25)					475 (0.12)	289 (0.08)
395/X	Renhaven l., 65 to 90% slopes	8671 (7.34)	8547 (7.27)	1650 (1.88)	2241 (1.92)			900 (0.97)	485 (0.75)	11221 (2.76)	11273 (2.95)
395/Y	Renhaven l., 65 to 90% slopes	1469 (1.24)	1483 (1.26)							1469 (0.36)	1483 (0.39)
396/V	Bateman sil, 0 to 10% slopes	75 (0.06)	859 (0.73)							75 (0.02)	859 (0.22)
396/W	Bateman sil, 10 to 35% slopes	3499 (2.96)	7679 (6.53)					396 (0.43)	337 (0.52)	3895 (0.96)	8016 (2.10)
396/X	Bateman sil, 35 to 65% slopes	4335 (3.67)	5641 (4.80)					745 (0.80)	331 (0.51)	5080 (1.25)	5972 (1.56)
396/Y	Bateman sil, 65 to 90% slopes	50 (0.04)	131 (0.11)							50 (0.01)	131 (0.03)
397/W	Darby sicl, 10 to 35% slopes							102 (0.11)	352 (0.54)	102 (0.03)	352 (0.09)
397/X	Darby sicl, 35 to 65% slopes							850 (0.91)	992 (1.54)	850 (0.21)	992 (0.26)
400/W	Holderman gr. l., 10 to 35% slopes					754 (0,70)		1285 (1,38)	576 (0,89)	2039 (0.50)	576 (0.15)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
400/X	Holderman gr. l., 35 to 65% slopes					584 (0.54)		3222 (3.46)	1168 (1.81)	3806 (0.93)	1168 (0.31)
400/Y	Holderman gr. l., 65 to 90% slopes							3060 (3.29)	1301 (2.01)	3060 (0.75)	1301 (0.34)
410/W	Winberry vgr. l., 10 to 35% slopes					323 (0.30)		242 (0.26)	22 (0.03)	565 (0.14)	22 (0.006)
410/X	Winberry vgr. l., 35 to 65% slopes					278 (0.26)		1311 (1.41)	377 (0.58)	1589 (0.39)	377 (0.10)
410/Y	Winberry vgr. l., 65 to 90% slopes southerly aspect							2037 (2.19)	911 (1.41)	2037 (0.50)	911 (0.24)
410/Yn	Winberry vgr. l., 65 to 90% slopes northerly aspect							140 (0.15)	142 (0.22)	140 (0.03)	142 (0.04)
564/Y	Umpcoos gr. l., 65 to 90% slopes	510 (0.43)	263 (0.22)							510 (0.13)	263 (0.07)
721/W	Siskiyou sl, 10 to 35% slopes					148 (0.14)	182 (0.22)			148 (0.04)	182 (0.05)
721/X	Siskiyou sl, 35 to 65% slopes					1240 (1.15)	1310 (1.57)			1240 (0.30)	1310 (0.34)
721/Y	Siskiyou sl, 65 to 90% slopes southerly aspect					931 (0.86)	478 (0.57)	304 (0.33)	184 (0.28)	1235 (0.30)	662 (0.17)
721/Yn	Siskiyou sl, 65 to 90% slopes northerly aspect					540 (0.50)	21 (0.03)			540 (0.13)	21 (0.005)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
722/W	Holland l., 10 to 35% slopes					1460 (1.35)	1668 (2.00)	39 (0.04)	40 (0.06)	1499 (0.37)	1708 (0.45)
722/X	Holland l., 35 to 65% slopes					4016 (3.72)	2169 (2.60)	887 (0.95)	883 (1.37)	4903 (1.20)	3052 (0.80)
722/Y	Holland l., 65 to 90% slopes southerly aspect					941 (0.87)	182 (0.22)	457 (0.49)	275 (0.43)	1398 (0.34)	457 (0.12)
722/Yn	Holland l., 65 to 90% slopes northerly aspect					1259 (1.17)	50 (0.06)			1259 (0.31)	50 (0.01)
722m/W	Holland l, metavolcanic rock substratum, 10 to 35% slopes					818 (0.76)	1216 (1.46)			818 (0.20)	1216 (0.32)
722m/X	Holland l, metavolcanic rock substratum, 35 to 65% slopes					5192 (4.81)	5667 (6.80)	179 (0.19)	360 (0.56)	5371 (1.32)	6027 (1.58)
723/W	Barron gr. l., 10 to 35% slopes					365 (0.34)	288 (0.35)			365 (0.09)	288 (0.08)
723/X	Barron gr. l., 35 to 65% slopes					1154 (1.07)	1028 (1.23)			1154 (0.28)	1028 (0.27)
723/Y	Barron gr. l., 65 to 90% slopes					130 (0.12)	153 (0.18)			130 (0.03)	153 (0.04)
724/W	Lettia loam, 10 to 35% slopes					1783 (1.65)	1178 (1.41)	157 (0.17)	159 (0.25)	1940 (0.48)	1337 (0.35)
724/X	Lettia loam, 35 to 65% slopes					1343 (1.25)	797 (0.96)	960 (1.03)	730 (1.13)	2303 (0.57)	1527 (0.40)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
724m/X	Lettia loam metavolcanic rock substratum, 10 to 35% slopes					3842 (3.56)	4293 (5.15)	76 (0.08)	155 (0.24)	3918 (0.96)	4448 (1.16)
731/V	Vena gr. l., 0 to 10% slopes							69 (0.07)	156 (0.24)	69 (0.02)	156 (0.04)
731/W	Vena gr. l., 10 to 35% slopes southerly aspect					1611 (1.49)	532 (0.64)	471 (0.51)	542 (0.84)	2082 (0.51)	1074 (0.28)
731/Wn	Vena gr. l., 35 to 65% slopes northerly aspect					275 (0.25)	25 (0.03)			275 (0.07)	25 (.007)
731/X	Vena gr. l., 35 to 65% slopes southerly aspect					1587 (1.47)	476 (0.57)	1352 (1.45)	814 (1.26)	2939 (0.72)	1290 (0.34)
731/Xn	Vena gr. l., 35 to 65% slopes northerly aspect					268 (0.25)	37 (0.04)	40 (0.01)	11 (0.02)	308 (0.08)	48 (0.01)
731/Y	Vena gr. l., 65 to 90% slopes southerly aspect					1930 (1.79)	1962 (2.36)	2641 (2.84)	2023 (3.13)	4571 (1.12)	3985 (1.04)
731/Yn	Vena gr. l., 65 to 90% slopes northerly aspect					385 (0.36)	382 (0.46)			385 (0.09)	382 (0.10)
732/V	Shippa vgr. l., 0 to 10% slopes							17 (0.02)	39 (0.06)	17 (0.004)	39 (0.01)
732/X	Shippa vgr. l., 10 to 35% slopes					95 (0.09)	90 (0.11)	233 (0.25)	128 (0.20)	328 (0.08)	218 (0.06)
732/Y	Shippa vgr. l., 35 to 90% slopes					696 (0.65)	304 (0.36)	2730 (2.93)	1591 (2.46)	3426 (0.84)	1895 (0.50)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
741/V	Freezner l., 0 to 10% slopes							391 (0.42)	224 (0.35)	391 (0.10)	224 (0.06)
741/W	Freezner l., 10 to 35% slopes southerly aspect					2584 (2.39)	836 (1.00)	3457 (3.71)	3515 (5.44)	6041 (1.48)	4351 (1.14)
741/Wn	Freezner l., 10 to 35% slopes northerly aspect					413 (0.38)	37 (0.04)			413 (0.10)	37 (0.01)
741/X	Freezner l., 35 to 65% slopes southerly aspect					382 (0.35)	194 (0.23)	1703 (1.83)	1631 (2.52)	2085 (0.51)	1825 (0.48)
741/Xn	Freezner l., 35 to 65% slopes northerly aspect					177 (0.16)	16 (0.02)			177 (0.04)	16 (0.004)
743/W	Selmac sl, 10 to 35% slopes					1056 (0.98)	440 (0.53)			1056 (0.26)	440 (0.12)
770/W	Pearsoll gr. cl, 10 to 35% slopes	47 (0.05)	622 (0.53)			53 (0.05)	106 (0.13)			100 (0.02)	728 (0.19)
770/X	Pearsoll gr. cl, 35 to 65% slopes	329 (0.37)	380 (0.33)					147 (0.16)	423 (0.65)	476 (0.12)	803 (0.21)
770/Y	Pearsoll gr. cl, 65 to 90% slopes	1607 (1.83)	2407 (2.06)			1007 (0.93)	620 (0.74)	50 (0.05)	162 (0.25)	2664 (0.65)	3189 (0.83)
771/W	Cornutt gr. cl, 10 to 35% slopes	109 (0.12)	1452 (1.25)			36 (0.03)	70 (0.08)			145 (0.04)	1522 (0.40)
771/X	Cornutt gr. cl, 35 to 65% slopes	347 (0.39)	516 (0.44)					63 (0.07)	181 (0.28)	410 (0.10)	697 (0.18)
771/Y	Cornutt gr. cl, 65 to 90% slopes	763 (0.87)	1160 (0.99)			235 (0.22)	107 (0.13)	21 (0.02)	69 (0.11)	1019 (0.25)	1336 (0.35)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
824/W	Jayar vgr. l., 10 to 35% slopes southerly aspect			162 (0.18)	56 (0.05)					162 (0.04)	56 (0.01)
824/Wn	Jayar vgr. l., 10 to 35% slopes northerly aspect			162 (0.18)	187 (0.16)					162 (0.04)	187 (0.05)
824/X	Jayar vgr. l., 35 to 65% slopes southerly aspect			249 (0.28)	163 (0.14)					249 (0.06)	163 (0.04)
824/Xn	Jayar vgr. l., 35 to 65% slopes northerly aspect			119 (0.14)	67 (0.06)					119 (0.03)	67 (0.02)
824/Y	Jayar vgr. l., 65 to 90% slopes southerly aspect			106 (0.12)	70 (0.06)					106 (0.03)	70 (0.02)
824/Yn	Jayar vgr. l., 65 to 90% slopes northerly aspect			51 (0.06)	29 (0.02)					51 (0.01)	29 (0.01)
825/W	Skymor vgr. l., 10 to 35% slopes southerly aspect			69 (0.08)	24 (0.02)					69 (0.02)	24 (0.06)
825/Wn	Skymor vgr. l., 10 to 35% slopes northerly aspect			69 (0.13)	80 (0.08)					69 (0.02)	80 (0.02)
825/X	Skymor vgr. l., 35 to 65% slopes southerly aspect			116 (0.13)	109 (0.09)					116 (0.03)	109 (0.03)
825/Xn	Skymor vgr. l., 35 to 65% slopes northerly aspect			80 (0.09)	45 (0.04)					80 (0.02)	45 (0.01)
825/Y	Skymor vgr. l., 65 to 90% slopes southerly aspect			71 (0.08)	47 (0.04)					71 (0.02)	47 (0.01)
825/Yn	Skymor vgr. l., 65 to 90% slopes northerly aspect			34 (0.04)	19 (0.02)					34 (0.01)	19 (0.005)

TABLE I

ACRES AND PROPORTIONATE EXTENT OF EACH SOIL PHASE BY RESOURCE AREA AND FOR THE ENTIRE ROSEBURG DISTRICT

MAP SYMBOL	SOIL NAME	RESOURCE AREA								TOTAL	
		DRAIN		DILLARD		SOUTH UMPQUA		NORTH UMPQUA			
		BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)	BLM Acres & (%)	PRIVATE Acres & (%)
R/X	Rock land, 35 to 65% slopes	73 (0.06)	75 (0.06)	8 (0.01)	74 (0.06)			739 (0.79)	465 (0.71)	820 (0.20)	605 (0.16)
R/Y	Rock land, 65 to 90% slopes southerly aspect	1666 (1.41)	1319 (1.12)	1636 (1.86)	1928 (1.65)	1123 (1.04)	542 (0.65)	2222 (2.39)	1849 (2.86)	6647 (1.63)	5638 (1.48)
R/Yn	Rock land 65 to 90% slopes northerly aspect			271 (0.31)	758 (0.65)			94 (0.10)	95 (0.15)	365 (0.09)	853 (0.22)
	Total land mapped	118173	117586	87976	116644	107902	83258	93080	64559	407131	382047
	Total public land unmapped	9622		2555		2784		3486		18447	
	Total public land	127795		90531		110686		96556		425578	

figure makes it possible to calculate the acreage of each soil phase for each mapping unit. It is essential that the mapping unit descriptions be used for determining the location and extent of each soil series in an association when the map is used. To find information about individual soil series, refer to the Table of Contents in the report to locate the pages that contain the tables or descriptive material for the various kinds of information. Persons using the report in the field should refer to the section on descriptions of soil series and mapping units. This will help them become acquainted with the characteristics and the field relationships of individual soils to land form and slope positions.

If a person wants to know how a specific area of land can be expected to behave under certain treatments or silvicultural practices, he should:

FIRST, locate the area on the soil map. From the map one learns the dominant soils of the association in each mapping unit and the dominant soils of the association in each mapping unit and the dominant slope group.

SECOND, turn to the report section called, Description of Soils and Mapping Units. Here, one finds the major, as well as the minor soils, of each mapping unit, and their position and distribution on the terrain.

THIRD, turn to the sections entitled: Soil Behavior (under Descriptions of Soil Series, Section IV), Soil Properties and Qualities (Section V), and Soil Use and Management (Section VI). From these sections the soil inventory user will obtain detailed information on many different applied uses and management recommendations for each kind of soil. Included in these sections are characterization data and interpretations of significance to erosion, reforestation, fertilizer response, nutrient balance, site index, recreational development, road location, and other practical uses of the soil. For many applied use objectives, the soils are rated according to their degree of suitability or limitation in tables. Definitions and criteria used to rate the soils are given under the appropriate heading in the report.

Persons interested in the climate, geology, and broad pattern of soil and vegetation distribution should turn to the section entitled: General Nature of the Roseburg District (Section III). The soil taxonomy system and its application to the soils of the Roseburg District is summarized in the section on Soil Classification and Morphology (Section VII).

III. GENERAL NATURE OF THE ROSEBURG DISTRICT

A. Climate

The climate is characterized by warm dry summers and cool wet winters (Sterns, 1960). Position and intensity of high and low pressure systems over the north Pacific Ocean largely determine the climate in the Roseburg District. Moist maritime air masses moving from west to east provide most of the precipitation in the winter months. Rainfall is lowest in major valleys and increases with increasing elevation. Rainfall varies from a low of 25 inches in Canyonville to a high of 70 inches in Smith River near Yellow Creek (Figure 2).

The broad range in elevations in the District results in a proportional variance in temperatures. Daytime and nighttime temperatures fluctuate more during summer because of relatively cloud-free skies and low humidity.

Temperatures at Roseburg range from a record low of minus 1° F. in January to a record high of 106° F. in July. Average January temperature is 40° F., and average July temperature is 68° F. Table 2 shows means and extremes in weather data for the Roseburg weather station.

Snowfall is generally light over most of the District lands. Usually several light snowfalls cover the ground down to the 1,000 foot elevation. At higher elevations (3,000 - 4,000 feet), snow will persist most of the winter months. Deadman Mountain, upper reaches of Rock Creek and Canton Creek, and Thunder Mountain receive significant amounts of snow.

Soil moisture and soil temperature as influenced by climate are used in classifying soils. Two moisture regimes apply to the Roseburg area: Xeric and Udic. In the Xeric regime, soils are dry (equal to or more than 15 bars water tension) between depths of 4 and 12 inches for more than 45 consecutive days after June 21 in 6 out of 10 years. Most of the soils in the District fall into this category. The Udic regime soils are moist most of the year. The soils in this regime are not dry for as long as 45 consecutive days during the summer season in most years. The Udic soils generally receive more than 50 inches of precipitation in the Roseburg District.

Three soil temperature regimes occur in the District. They are mesic, frigid and cryic. Mesic means that average annual soil temperatures are between 47° F. and 59° F. and the mean winter

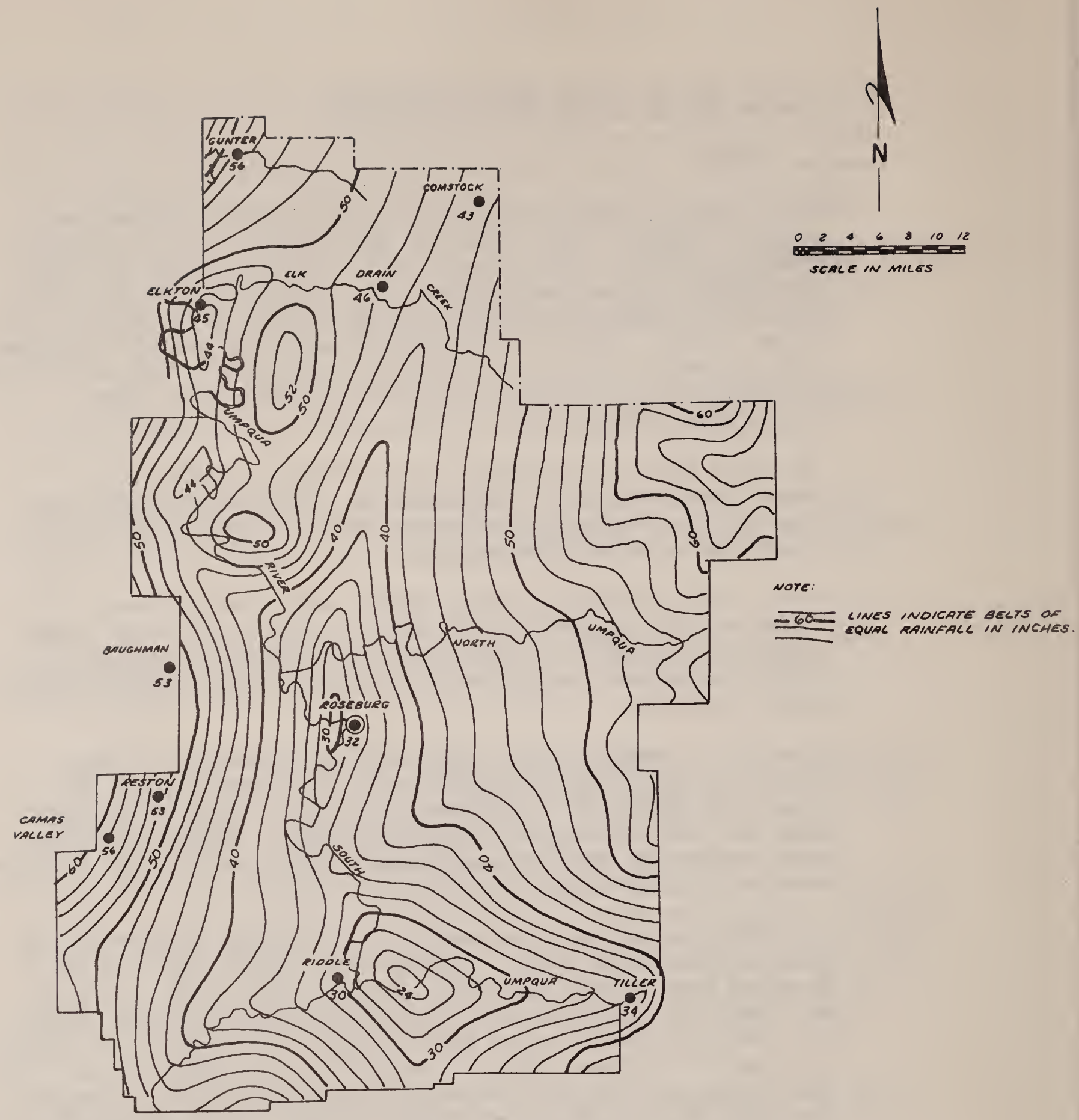


Figure 2. Isohyetal Map, Normal Annual Precipitation for the Roseburg District

Table 2 Means and Extremes in Weather for Roseburg Weather Station[1]

Month	Temperature							Precipitation						Relative Humidity	
	Normal			Extremes											
	Daily Maximum	Daily Minimum	Monthly	Record Highest	Year	Record Lowest	Year	Normal Total	Maximum Monthly	Year	Minimum Monthly	Year	Mean Total	10:00 A.M. PST	4:00 P.M. PST
								(b)						11	11
J	47.2	33.4	40.3	65	1959	- 1	1962	5.51	10.98	1964	1.36	1962	3.2	86	73
F	51.9	34.6	43.3	72	1963	13	1956	4.21	9.46	1958	1.04	1964	0.3	83	66
M	56.7	36.4	46.6	81	1960	19	1956	3.42	6.46	1961	2.23	1954	0.7	73	56
A	63.5	39.4	51.5	90	1957	27	1955	1.93	5.28	1963	0.59	1959	0.2	63	50
M	69.4	43.5	56.5	95	1956	26	1954	1.85	3.80	1960	0.30	1954	T	61	50
J	75.1	47.9	61.5	102	1961	34	1954	1.50	4.97	1958	T	1960	0.0	59	46
J	84.0	51.8	67.9	106	1961	39	1962	0.21	0.48	1958	T	1962+	0.0	54	34
A	83.8	51.4	67.6	103	1960	41	1956	0.31	1.29	1953	T	1963+	0.0	56	36
S	78.0	47.5	62.8	102	1955	32	1956	1.00	1.98	1957	0.44	1964	0.0	63	41
O	65.9	42.9	54.4	91	1958	26	1954	3.02	7.00	1956	0.92	1964	0.0	80	58
N	53.8	38.4	46.1	73	1955	15	1955	4.46	10.11	1961	0.80	1959	1.4	86	73
D	48.3	35.6	42.0	69	1958	18	1962	5.69	15.74	1955	2.00	1963	0.7	89	80
YR	64.8	41.9	53.4	106	Jul. 1961	- 1	Jan. 1962	33.11	15.74	Dec. 1555	T	Aug. 1963	6.5	71	55

1 Douglas County Commissioners, 1968
(b) Climatological standard normals (1931-1960)
* Less than one-half
T Trace, an amount too small to measure. Below-zero temperatures are preceded by a minus sign.

Unless otherwise indicated, dimensional units are: temperature in degrees F.; precipitation, including snowfall, in inches; and relative humidity in percent.

soil temperature is at least 9° F. colder than the mean summer soil temperature. Frigid means that the mean annual soil temperatures are less than 47° F. and mean winter temperatures are at least 9° F. colder than mean summer temperatures. Cyric means that the mean annual soil temperatures are less than 47° F. and mean winter temperatures are less than 9° F. colder than the mean summer temperatures.

Most of the soils in the survey area fall into the xeric-mesic zone. The udic-mesic zone occurs where annual rainfall is over 50 inches and the elevation is less than about 3,000 feet. The udic-frigid zone and the udic-cryic zone are found above 3,200 feet on southerly aspects, and above 2,800 feet on northerly aspects.

B. Geology and Geomorphology

The geology of the Roseburg District can appropriately be called a meeting grounds. Large areas of sedimentary, metamorphoric, and volcanic rocks all meet here. Sedimentary rocks of the Coast Range make up the majority of the north and west side of the District. The oldest rocks in the District are restricted to the rugged Klamath Mountains in the southern part. To the east are the youngest rocks. They make up the western portion of the Cascade Mountains. A general geology map (Figure 3) shows the distribution of the major formations.

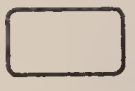
1. Coast Range

The Coast Range consists of Tertiary submarine basalts and marine sediment (Ramp, 1972). Sandstone and siltstone of the Tyee and Umpqua formations are the predominant types of rocks. The region is less deformed than the Klamath Mountains. Mineral wealth of the area is limited to sand and gravel with a few unworked coal mines. The geologic formations of the Coast Range are given in Table 3.

a. The Umpqua Formation consists of two members: (1) basalt flows, and (2) shaly siltstone with occasional beds of sandstone. The basalt member is thought to have been deposited in a marine environment. Generally, the basalt shows a "pillow" structure which resulted when the molten rock cooled rapidly. There are four areas of basalt (Figure 3). The basalt produces broad rounded hills and broad stream bottoms. Mt. Baldy is an example of this type of landform.

The siltstone member is a fine-grained, well-bedded sedimentary rock that is light gray when fresh and weathers to an olive brown. It contains thin beds of

Legend



Umpqua Formation - thinbedded, alternating dark gray siltstone and an occasional sandstone bed.

Umpqua Formation - basalt.

Tyee Formation - rhythmically bedded sandstone.

Dothan and Galice Formation - slightly metamorphosed sandstone, siltstone and shale.

Galice and Rogue Formations - greenish gray metamorphosed andesite flows.

Serpentine.

Granite - diorite.

Days Creek Formation - gray fine grained sandstone and siltstone.

Little Butte Volcanic Series - tuffs, andesite and breccias.

Little Butte Volcanic Series - scattered andesite and basalt flows mixed with tuffs.

Colestin - Fisher Formation - tuffs, breccias, conglomerates, and andesite flows.

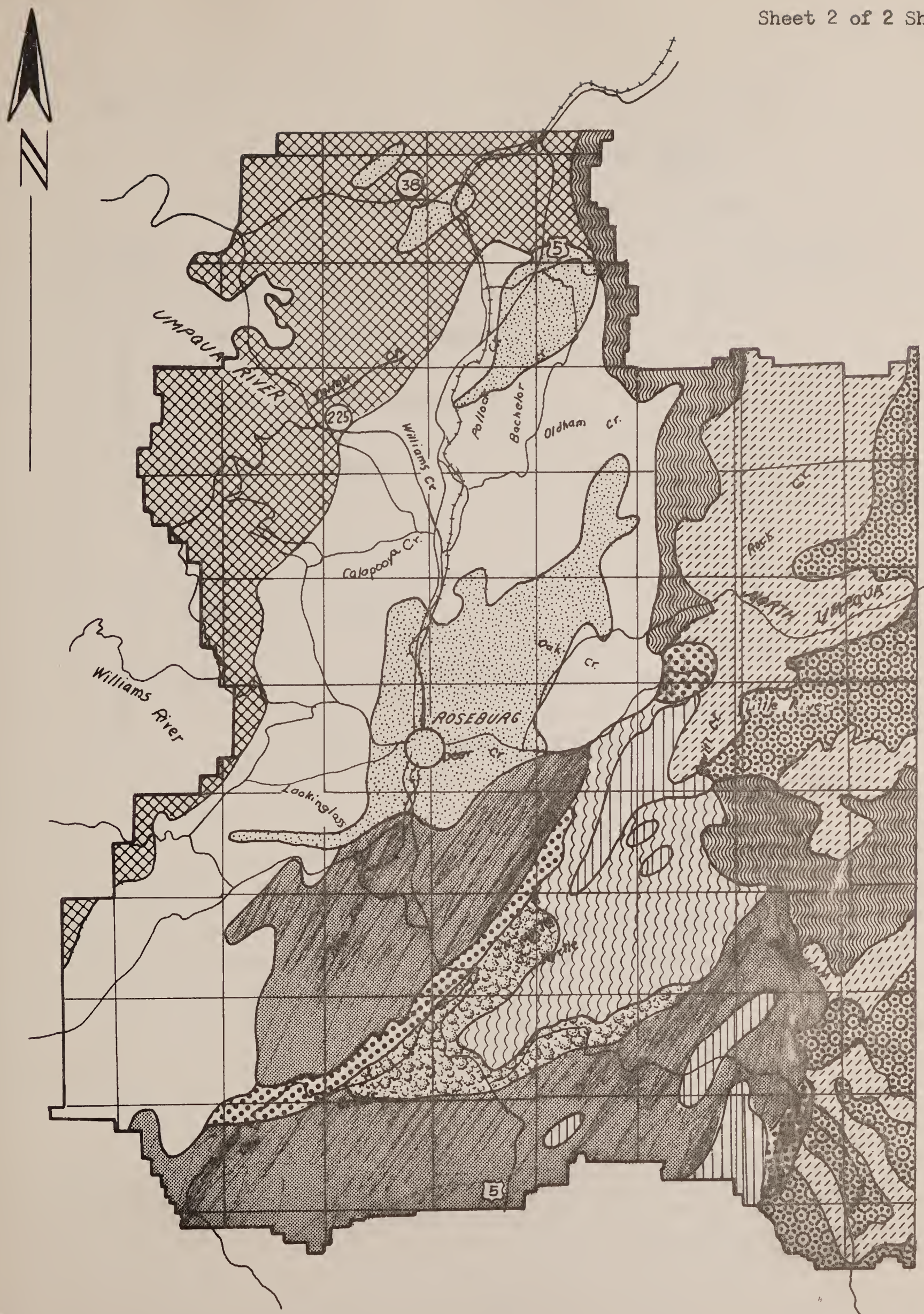


Figure 3. General Geology Map of the Roseburg District

Table 3

Geologic Formations in the Coast Range

Period	Epoch	Formation	Age Millions/Yrs.
Quaternary	Recent	Recent alluvium	1
	Pleistocene	Terrace deposits	1
Tertiary	Pliocene	Absent	13
	Miocene	Absent	25
	Oligocene	Absent	36
	Eocene	Elkton Siltstone Member of Tyee Fm.	58
		Tyee Fm. (Sandstone & Siltstone)	
		Upper Umpqua (Sandstone & Siltstone)	
		Lower Umpqua (Basalts, Thin Siltstone & Sandstone)	63

sandstone, shale and conglomerate. Siltstone occurs as narrow bands around the islands of basalt near Drain. However, southeast of Drain it becomes much more widespread. Most all of the low-lying hills such as Rice Hill, Turkey Hill and Marvin Hill are composed of siltstone. Yellow Creek Mountain marks the boundary between the Tyee Formation and the Umpqua Formation. Tyee sandstone, which is more resistant to geologic erosion, holds up Yellow Creek Mountain, while the gently rolling hills to the immediate east of Yellow Creek Mountain are composed of siltstone. Further south in Camas Valley and Boulder Creek, pockets of conglomerate occur within large areas of siltstone.

The siltstone member of the Umpqua Formation is easily eroded. Most of the hills are low and rounded. Where sandstone becomes more common, such as at Camas Mountain, the landscape becomes steeper with long narrow ridges and steeper side slopes.

b. Tyee Formation is a series of thick sandstone beds and thin siltstone layers. Unweathered sandstone is bluish gray but weathers to a light brown. Tyee Formation was originally described by Diller (1898) who named the sandstone after Tyee Mountain.

The Tyee Formation has a gentle southwest dip. This has resulted in steep northeast slopes and gentler southwest slopes with narrow ridge tops. Thistleburn, Middle, and Bell Ridges are examples. South of Buck Mountain the dip is mostly due west, hence most of the relatively gentle slopes have a west aspect. Yellow Creek Mountain and Renhaven Ridge serve to illustrate this point.

At the top of the Tyee Formation is a siltstone member. This siltstone is found north and south of Elkton around Old Blue Mountain and on the north side of Yellow Butte.

In areas where the Tyee Formation is deeply weathered, large slumps have occurred in the distant past. Very large slumps on the order of 10 to 15 acres make up many of the slopes in Little Wolf Creek, Miner Creek and Hubbard Creek watersheds.

In the extreme northwest part of the District (Smith River) the topography is characterized by very steep sideslopes and very narrow ridge tops and stream channels. The closer to the coast one goes, the more down cutting one sees that has resulted in deeply dissected canyons. This has been labled Type I Tyee (Burroughs, et. al., 1973). Figure 4 shows the steep headwalls and sideslopes that occur in Type I.

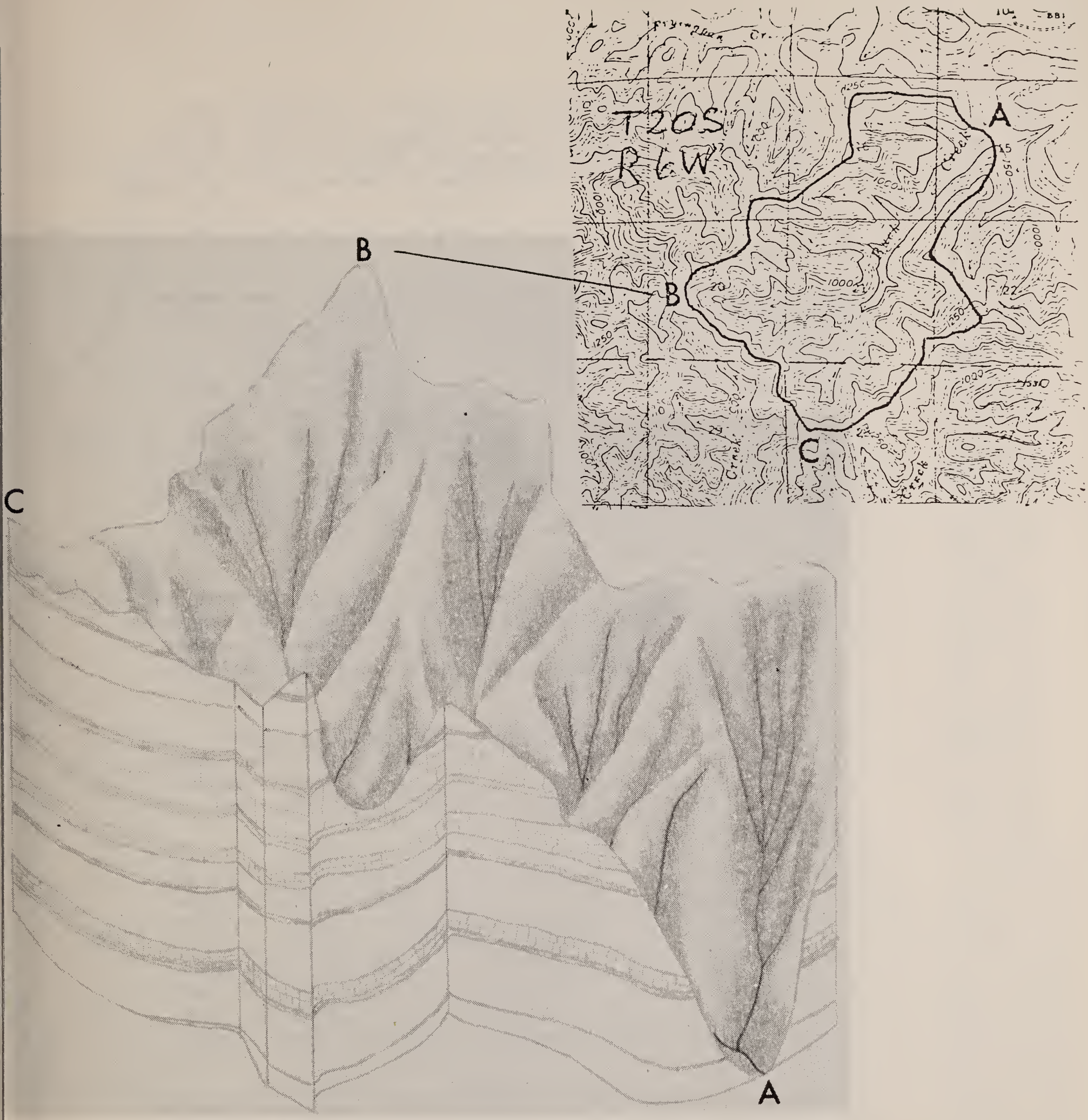


Figure 4. A block diagram of Type I sites, the steep, highly dissected terrain with sandstone bedrock. This diagram was made from the topographic map of the drainage basin outlined in upper right hand corner. The mouth of the basin is at point A, and two high points are identified as points B and C. The vertical scale of the block diagram is greatly exaggerated. Note the steep headwall areas below point B and above point A. (Burroughs et. al. 1973)

On the east side of the Tyee Formation, sideslopes are more gentle with large blocks of deep soils still on the hillside. Ridges are broader and relief is less. This type of landscape is called Type II Tyee and is illustrated in Figure 5.

2. Klamath Mountains

The Klamath Mountains are geologically complex. They consist of marine sediments and volcanic rocks that have been folded, faulted and slightly metamorphosed (Ramp, 1972). Table 4 lists the geologic formations in the Klamath Mountains. Topography is rugged. Major streams include Cow Creek and other tributaries to the South Umpqua River, such as Days Creek, Shivley Creek and Poole Creek. Cultivation of farm crops is restricted to areas bordering the major streams. Mining has yielded a variety of metals including gold, silver, copper, chromite, nickel, mercury, zinc, sand and gravel, building stone, barite, limestone, asbestos, talc, olivine and semiprecious gems.

a. The Dothan and Galice Formations include sedimentary members that consist of massive to thickly bedded sandstone and thin interbeds of dark mudstone. The beds have been greatly folded and faulted. Beds of sandstone and shale are recognizable. There are local spots of quartzite.

Long steep slopes with narrow ridge tops and narrow stream bottoms characterize the topography in the Dothan-Galice formations. Examples of this topography can be seen in Middle Creek, West Fork of Canyon Creek and Shivley Creek.

b. The volcanic members of the Galice Formation and the Rogue Formation consist of thick, greenish-gray altered andesite and basalt flows, tuffs and breccias. In many areas, the rocks are deeply folded and faulted to the point where they are difficult to identify. They are deeply weathered, a fact that makes this formation poor in hard rock for road surfacing. Gold and silver have been mined in this formation in the North Myrtle Creek drainage.

Slopes are more gentle in the volcanic rock areas than in the Dothan-Galice sedimentary rock areas. Long drainage-way with moderately steep sideslopes and rounded ridge tops are common in areas underlain by these old volcanic rocks. Examples of this type of topography are in the Lettishia Creek and Long Wiley Creek watersheds.

Figure 5. A block diagram of Type II Tyee. The slopes may range from 10% to 80% but the soils are deeper and the ridges are more rounded. Slumps and earthflows are the most common type of soil failure. This diagram was made from the topographic map of the drainage basin outlined in black in the upper right hand corner. The mouth of the basin is at A, and the high points are at B and C.

Table 4

Geologic Formations in the Klamath Mountains

Era	Period	Formation or Group	Age Millions/Yrs.
Cenozoic	Quaternary	Recent Alluvium and Terrace Deposits	0 13
	Tertiary	Absent	13 58
Mesozoic	Cretaceous	Myrtle Group: Days Creek Fm. (Sandstone, Conglomerate, Siltstone) Riddle Fm. (Conglomerate) Intrusive Rocks (Granite, Diorite, Serpentine)	58 135 135
	Jurassic	Galice Fm. (Sandstone, Black Shale, Andesite, Agglomerate)	
		Rouge Fm. (Tuff, Breccia, Agglomerate)	
		Dothan Fm. (Sandstone, Shale, Siltstone)	230
	Triassic	Applegate Group (Metavolcanics, Metasediments)	230

c. Serpentine in the District is limited to pre-Tertiary bedrock. Serpentine and peridotite form a discontinuous band that extends northeasterly through the central and southern part of the District. It extends from Cow Creek area around Iron Mountain northward to the Peel Store.

Serpentine is commonly a dark greenish rock. It is derived from peridotite. Some of the serpentine is located along faults. Serpentine and peridotite are important hosts for nickel, chromite, gold, silver, copper and platinum (Ramp, 1972).

d. Granite and Diorite bedrock is found in several large areas in the southeastern part of the District. It was introduced during the late Jurassic time (Baldwin, 1964).

The most common rock types are diorite, quartz-diorite and granite. For soil survey purposes it is convenient to combine all light-colored, coarse-grained intrusive rocks and call them granitoid rocks. When these rocks weather, they are referred to as "decomposed granite."

The granitoid rocks erode easily. Figure 6 shows the sharply dissected landscapes that commonly occur on this type of bedrock. Ridges are sharp, sideslopes are steep and usually short.

e. Days Creek Formation includes conglomerate, sandstone and siltstone of Cretaceous age. This formation is found around Myrtle Creek and the lower slopes in the Days Creek watershed. It is of minor extent.

3. Western Cascade Mountains

The Western Cascade Mountains are made of volcanic rocks of late Eocene through late Miocene ages. Table 5 lists the geologic formations in the Western Cascade Mountains. The area contains easily weathered tuffs and resistant andesite and basalt flows. The tuffs are mostly from ash-flows. Layers of tuffs form gentle topography frequently with large slump blocks. Examples of this type of topography are around Sampson Butte and Scott Mountain. The andesite and basalt flows produce ridge tops and long, steep uniform slopes. The upper end of the Canton Creek drainage serves as an example.

a. Colestine-Fisher Formation consists of volcanic rocks of nonmarine origin. The Colestine Formation consists of tuffs, tuff breccias, and a few lava flows of Eocene age. Areas of tuffs produce slumpy topography. The Fisher Formation (Hoover, 1963) contains tuffs, andesite

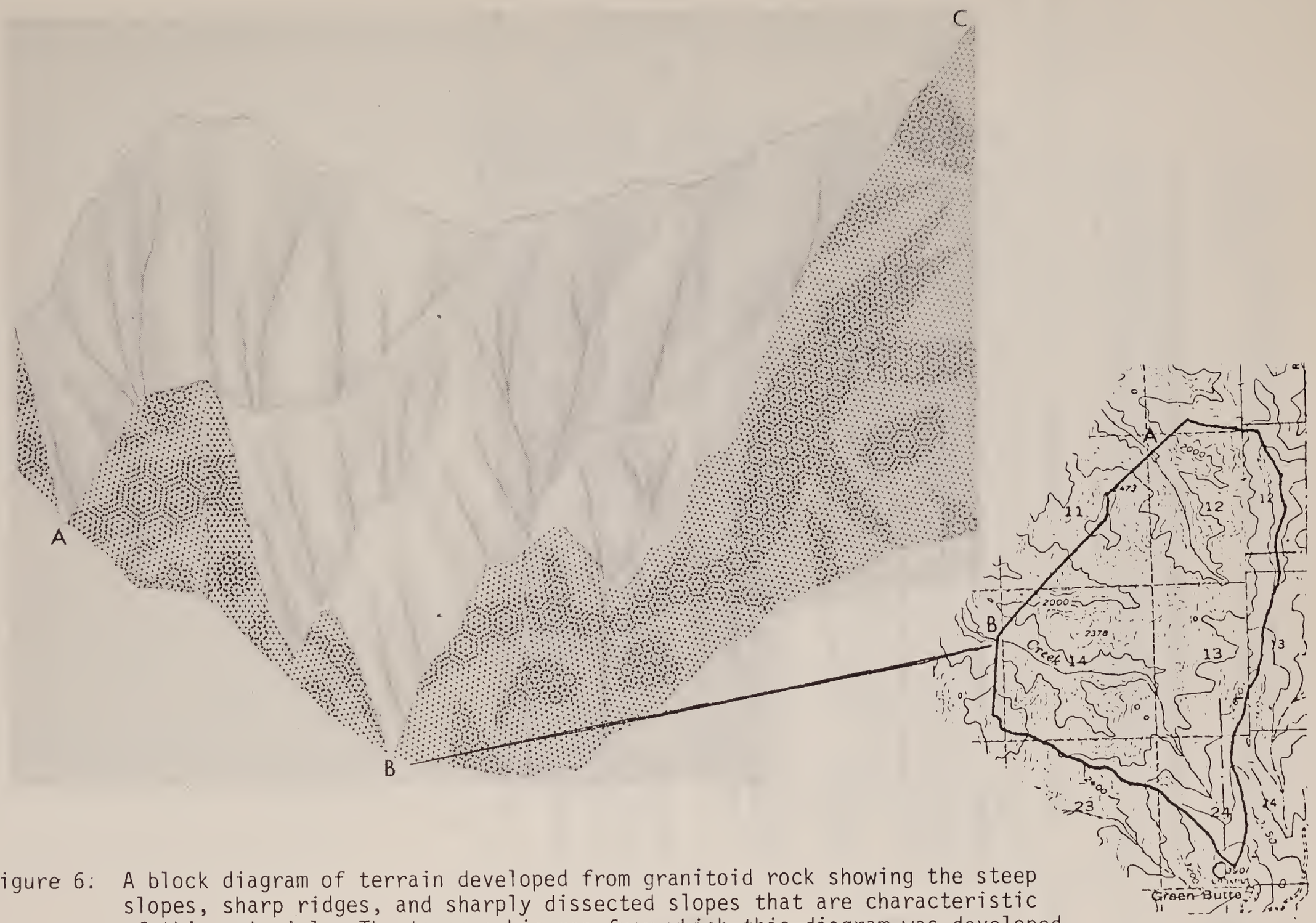


Figure 6: A block diagram of terrain developed from granitoid rock showing the steep slopes, sharp ridges, and sharply dissected slopes that are characteristic of this material. The topographic map from which this diagram was developed is in the upper end of the East Fork of Stouts Creek. Points A, B, and C may be used for orientation.

Table 5

Geologic Formations in the Western Cascade Mountains

Period	Epoch	Formation	Age Millions/Yrs.
Quaternary	Recent	Recent Alluvium	1
	Pleistocene	Terrace Deposits	1
Tertiary	Pliocene	Absent	13
	Miocene	Little Butte Volcanics (Andesite, Basalt, Tuffs)	25
	Oligocene	Little Butte Volcanics (Andesite, Basalt, Tuffs)	36
	Eocene	Colestine Fm. (Tuffs, Breccias, Tuffaceous Sediments)	58

flows, conglomerates and breccias. Generally it contains a larger percentage of competent rocks than the Colestine Formation.

b. Little Butte Volcanic Series consists of massive beds of tuffs of ash-flow origin and lesser amounts of flow rock, mainly andesite and basalt of Oleogocene age. The bottom portion of this formation is a welded tuff.

4. Geologic Materials and Associated Soils

The relationship between the kind of geologic material and the associated soil series is summarized in Table 6. Soils that occur on old stable landscapes can be formed in materials from two or more different kinds of bedrock because long-time weathering tends to produce material that is fairly uniform in mineralogy and texture within a certain climatic zone. Consequently, Honeygrove soils occur on old stable landforms underlain by sedimentary or volcanic rocks.

Soils that formed in parent material produced from a bedrock that has a distinctive mineralogy are restricted to areas underlain by that type of bedrock. The Pearsoll and Cornutt soils, for example, occur only in areas underlain by serpentinitic rocks.

Some of the metasedimentary rocks have a mineralogy and grain-size distribution that is similar to that of the sedimentary rocks, and therefore give rise to similar soil series on comparable landscape positions and in comparable climatic regimes. Kanid, Beekman, Vermisa, Pollard, McGinnis and Tishar soils may be underlain by either metasedimentary or sedimentary rocks.

Table 6

Geologic Materials and Associated Soils

Kind of Underlying Rock	Formation	Associated Soil Series
Sedimentary Rocks Sandstone, Siltstone	Tyee	Apt (50), Atring (394), Bateman (396), Bellpine (13), Digger (66), Honeygrove (14x), Jason (64), Jory (12), Larmine (393), Peavine (20x), Preacher (57), Renhaven (395), Umpcoos (564)
Sandstone, Siltstone, Shale	Upper Umpqua	Atring (394), Bateman (396), Beekman (371), Jayar (824), Kanid (370), Larmine (393), McGinnis (381), Pollard (380), Renhaven (395), Skymor (225), Tishar (382), Vermisa (372)
Igneous Rocks Granite, Granodiorite, Diorite	Unnamed	Barron (723), Holland (722), Lettia (724), Selmac (743), Siskiyou (721)
Serpentinitic Rocks	Unnamed	Cornutt (771), Pearsoll (770)
Andesite, Breccias, Tuffs, Agglomerates	Little Butte Volcanics	Blackly (10), Chamate (362), Cruiser (19), Freezner (741), Harrington (29), Holderman (400), Honeygrove (14t), Kilchis (35), Klickitat (323), Peavine (20t), Selmac (743), Shivigny (300), Shippa (732), Twindar (53), Vena (731), Winberry (410), Zango (70)
Basalt	Lower Umpqua	Darby (397), Freezner (741), Ritner (24), Witzel (36)
Metamorphic Rocks Metasediments, Graywacke, Mudstone, Metabasalt	Dothan & Galice	Beekman (371), Kanid (370), McGinnis (381), Pollard (380), Tishar (382), Vermisa (372)
Metaryholite, Gneiss	Galice & Rouge	Abegg (360), Holland (722m), Lettia (724m)

C. General Soil Map and Vegetation

A general soil map is presented in Figure 7. It contains 14 broad groupings of soils. The general soil association map is useful to persons wanting a general view of the major soils of the District. The mapping units show broad relationships between the soils and the climate, geology, and topography.

These broad groupings are called generalized soil associations. A description of each soil association follows. Each description identifies the major soils, gives their proportions, describes where they occur on the landscape, describes the common vegetation, and identifies minor soils.

Figure 7

LEGEND

Symbol	General Soil Association
	UDIC-MESIC SOILS
1	Digger (66) - Jason (64) - Preacher (57) Association 35 to 90 percent slopes. Moderately deep and shallow, loamy-skeletal soils; and deep, brown, fine loamy soils from sedimentary rocks.
2	Honeygrove (14x) - Peavine (20x) - Preacher (57) Association, 10 to 65 percent slopes. Deep and moderately deep, red, clayey soils; and deep, brown, fine loamy soils from sedimentary rocks.
3	Honeygrove (14t) - Shivigny (300) Association, 35 to 90 percent slopes. Deep and moderately deep, reddish-brown loamy-skeletal soils from volcanic rocks.
4	Klickitat (323) - Harrington (29) Association, 35 to 90 percent slopes. Deep and moderately deep, reddish-brown loamy-skeletal soils from volcanic rocks.
	UDIC-FRIGID SOILS
5	Holderman (400) - Winberry (410) Association, 35 to 90 percent slopes. Moderately deep and shallow, loamy-skeletal soils from volcanic rocks at high altitudes.
	XERIC-MESIC SOILS
6	Atring (394) - Bateman (396) - Renhaven (395) Association, 10 to 65 percent slopes. Moderately deep, loamy-skeletal soils; deep, red, clayey soils; and deep, brown, fine-loamy soils from sedimentary rocks.
7	Jory (12x) - Renhaven (395) Association, 10 to 35 percent slopes. Deep, red, clayey soils; and deep, brown, fine-loamy soils from volcanic and sedimentary rocks.

Symbol	General Soil Association
	XERIC-MESIC SOILS cont.
8	Pollard (380) - McGinnis (381) - Beekman (371) Association, 10 to 65 percent slopes. Deep, red, clayey and clayey-skeletal soils; and moderately deep, brown, loamy-skeletal soils from sedimentary rocks.
9	Beekman (371) - Vermisa (370) Association, 35 to 90 percent slopes. Moderately deep and shallow, loamy-skeletal soils from metasedimentary rocks.
10	Pearsoll (770) - Cornutt (771) Association, 35 to 90 percent slopes. Moderately deep and shallow, red, clayey and clayey-skeletal soils from serpentinitic rocks.
11	Holland (722) - Lettia (724) - Siskiyou (721) Association, 35 to 65 percent slopes. Deep, brown, fine-loamy soils; deep, red, clayey soils; and moderately deep, coarse-loamy soils from granitic rocks.
12	Lettia (724m) - Holland (722m) Association, 35 to 65 percent slopes. Deep, red, clayey soils; and deep, brown, fine-loamy soils from metavolcanic rocks and gneiss.
13	Freezner (741) - Vena (731) Association, 10 to 65 percent slopes. Deep, red, clayey soils; and moderately deep, loamy-skeletal soils from volcanic rocks.
14	Freezner (741) - Chamate (362) - Shippa (732) Association, 10 to 90 percent slopes. Deep, red, clayey soils; deep, brown, loamy-skeletal soils; and shallow brown, loamy-skeletal soils from volcanic rocks.

9W. 8 7 6 5 4 3 2 1W 1E.

20S 21 22 23 24 25 26 27 28 29 30 31 32S

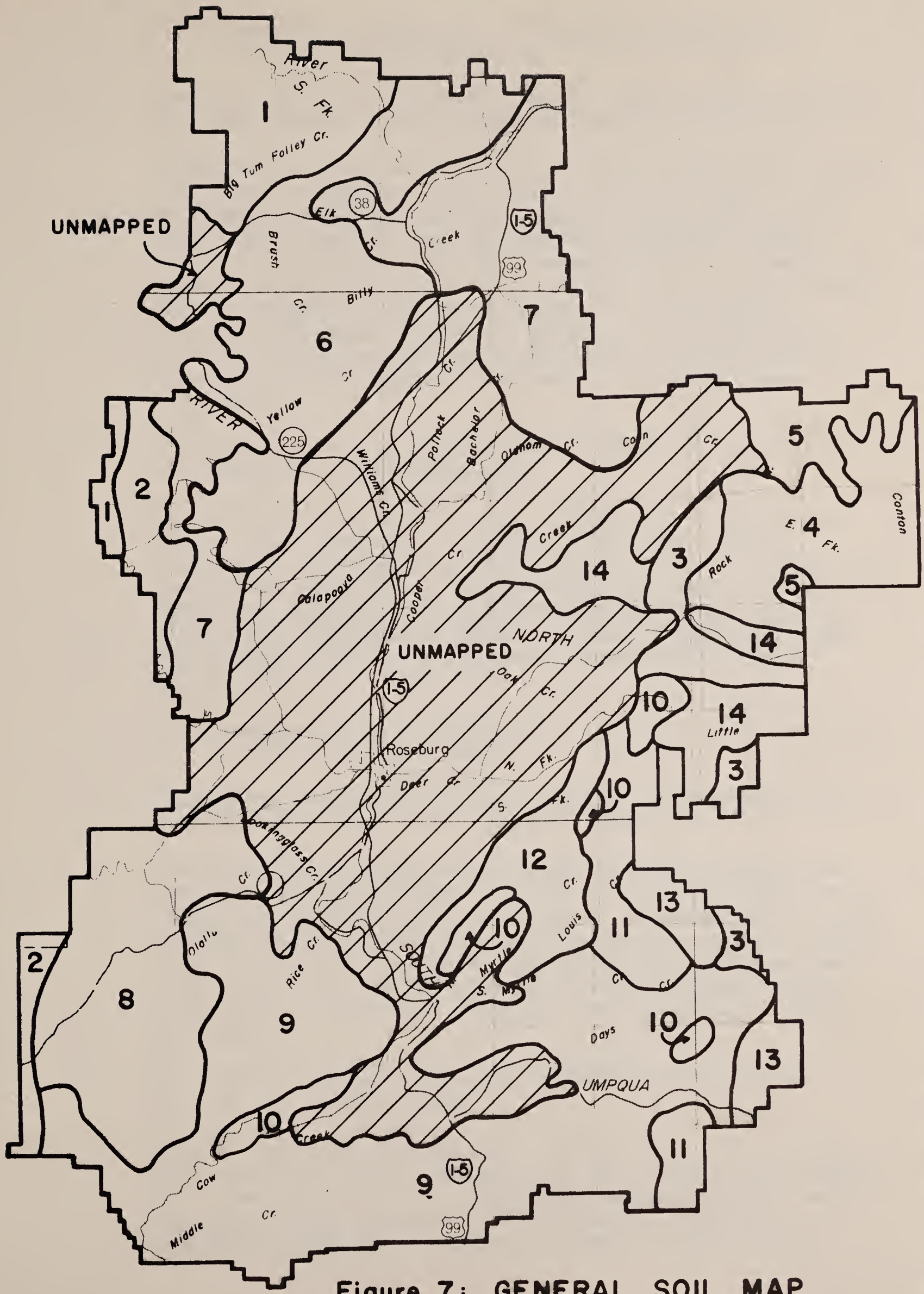


Figure 7: GENERAL SOIL MAP
ROSEBURG DISTRICT

1. Digger (66) - Jason (64) - Preacher (57) Association
35 to 90 percent slopes

The soils of this association occur on Tyee sandstone in areas receiving greater than 50 inches of annual precipitation.

Digger soils occupy about 35 percent of the association. They are found on sideslopes with slope gradients between 50 and 80 percent, on sharp ridge tops, and on steep finger ridges. Jason soils comprise about 25 percent of the area. These soils are located on very steep headwalls, on very steep sideslopes adjacent to drainages, and on very steep sideslopes. They are normally found on slopes of 65 to 100 percent. Preacher soils make up about 20 percent of the association. They are located on sideslopes with slope gradients of 35 to 60 percent, broad rounded ridge tops, and rounded finger ridge noses.

Inclusions of Honeygrove and Apt soils occur on old terraces, old slumps, and broad ridge tops.

Douglas-fir is the most abundant single specie. Western red cedar, western hemlock, and grand fir are mixed in with Douglas-fir. The ground cover includes salal, red huckelberry, sword fern, bracken fern, thimbleberry, and oxalis. Slickleaf (Ceanothus velutinus) and redstem (Ceanothus sanguineus) are also found. Slickleaf is the most common. Redstem is found on the better sites in the extreme northwestern corner of the District.

2. Honeygrove (14x) - Peavine (20x) - Preacher (57) Association
10 to 65 percent slopes

This association occurs on Tyee sandstone in areas receiving more than 50 inches of annual precipitation.

Honeygrove soils occupy about 40 percent of the association. They occur on broad rounded ridge tops, old slumps, and gentle sideslopes. Peavine soils occupy about 30 percent of the area. Peavine soils are found adjacent to Honeygrove on short slopes of 30 to 50 percent. Preacher soils occupy about 30 percent of the area. They mostly occur on steep sideslopes, recent landslides, and on narrow ridge tops with gradients of 30 to 65 percent.

Inclusions of Digger soils are mingled with the Preacher soils on the steeper slopes.

Douglas-fir is the most abundant single specie. Western red cedar, western hemlock, and grand fir are mixed in with Douglas-fir. The ground cover includes salal, red huckleberry, sword fern, and scattered clumps of rhododendron. Slickleaf (Ceanothus velutinus) is the most common Ceanothus specie.

3. Honeygrove (14t) - Shivigny (300) Association
10 to 35 percent slopes

This association occurs over volcanic rocks of the Little Butte Formation. Most of the area is underlain by tuff, breccia and some andesite bedrock.

Honeygrove soils occupy about 60 percent of the association. Honeygrove and Shivigny occur at random. They both occur on gently sloping topography.

Inclusions of Klickitat, Harrington and Digger soils do occur. Klickitat and Harrington soils occur on the steep slopes in Rock Creek Watershed, on Thunder Mountain and in Evarts Creek Watershed. Digger soils occur on steep slopes on Deadman Mountain.

Douglas-fir is the most abundant specie. Western red cedar, western hemlock and grand fir are mixed with Douglas-fir. Ground cover includes salal, red huckleberry, sword fern, and scattered clumps of rhododendron. Slickleaf is the most common Ceanothus specie.

4. Klickitat (323) - Harrington (20) Association
35 to 90 percent slopes

This association occurs on the Little Butte Formation, mainly from andesite, tuffs, and basalt bedrock. It covers areas receiving more than 50 inches of annual precipitation.

Klickitat soils occupy about 50 percent of the association. Klickitat soils occur on slopes of 35 to 50 percent. Harrington soils occupy about 40 percent of the association. They occur on slopes of 50 to 90 percent. They are on steep sideslopes and very narrow ridge tops.

Inclusions of Honeygrove, Blachly and rock land occur throughout the association. Honeygrove occurs on gentle slopes up to 40 percent. Blachly soils also occur on gentle slopes above 2600 feet elevation. Rock land occurs on canyon walls and slopes over 80 percent.

Douglas-fir is the most abundant specie. Other tree species include white pine, sugar pine, grand fir, western red cedar, and western hemlock. Ground cover includes red huckleberry, salal, sword fern, bracken fern, and oxalis. Slickleaf grows readily following a fire on Klickitat soils.

5. Holderman (400) - Winberry (410) Association
10 to 65 percent slopes

This association occurs on Little Butte Formation at high elevations in areas of annual precipitation greater than 50 inches.

Holderman soils occupy about 60 percent of the association. They occur on the gentle slopes. Winberry soils occupy about 40 percent of the unit. They occur on sloping and very steep slopes with slope gradients of 10 to 90 percent.

Inclusions of Cruiser soil occur on the gentle topography.

Douglas-fir, white pine, noble fir, knobcone pine and sugar pine as a mixture on these soils. Ground cover includes bear grass, rhododendron, kinickinic, princes pine, twin flower and salal.

6. Atring (394) - Bateman (396) - Renhaven (395) Association
10 to 65 percent

This soil association occurs on Tyee sandstone in areas receiving less than 50 inches of annual precipitation.

Atring soils occupy about 35 percent of the association. They are found on sideslopes with slope gradients between 50 and 80 percent, on steep sharp ridge tops, and steep sideslopes. Bateman soils make up about 30 percent of the mapping unit. These soils are located on the gentle topography such as broad ridge tops, gentle sideslopes, and old slumps. Renhaven soils occupy about 20 percent of the association. They are located on sideslopes with slope gradients of 35 to 60 percent, broad rounded ridge tops, and recent slumps.

Inclusions of Larmine and rock land occur on very steep sideslopes, headwalls, and on the escarpment between the Tyee formation and Umpqua formation.

Douglas-fir is the most abundant single specie. Mixed with Douglas-fir are grand fir, incense cedar and madrone. Ground cover includes poison oak, ocean spray, and grass. Slickleaf (Ceanothus velutinus) and deer brush (Ceanothus integerrimus) are found in this unit. Slickleaf is found on the moist sites while deer brush occupies the drier sites.

7. Jory (12x) - Renhaven (395) Association
10 to 35 percent slopes

This association occurs on Tyee sandstone in areas receiving less than 50 inches of annual precipitation.

Jory soils occupy about 55 percent of the association. They are found on the most gentle topography in the mapping unit. They are found on flat ridge tops, old slumps, and gentle sideslopes. Renhaven soil makes up about 30 percent of the unit. These soils are located on broad ridge tops, gentle sideslopes, and recent slumps.

Inclusions of Atring soils occur on the steep sideslopes and sharp ridge tops. Larmine soils also occur on very steep topography such as the canyon walls next to the Umpqua River.

Douglas-fir is the most abundant single specie. Mixed with Douglas-fir are grand fir, incense cedar and madrone. Ground cover includes poison oak, ocean spray, grasses and manzanita. Slickleaf (Ceanothus velutinus) and deer brush (Ceanothus integerrimus) occur in this unit. Slickleaf occupies the moist sites while deer brush occurs on the drier sites.

8. Pollard (380) - McGinnis (381) - Beekman (371) Association
10 to 65 percent slopes

This association occurs on Umpqua Formation in areas receiving less than 50 inches of annual precipitation.

Pollard soils occupy about 35 percent of the association. They are found on gentle topography such as sideslopes with slope gradients less than 35 percent, broad ridge tops and old slumps. McGinnis soils occur along with the Pollard soils. They occur on short, steep slopes adjacent to Pollard soils. Beekman soils occur on sharp ridge tops, steep finger ridges and sideslopes that have slope gradients of 50 to 70 percent.

Inclusions of Jory soil occur in the Coquille drainage. Low elevation gentle topography in Camas Valley and Twelve Mile drainages contain Jory soils. Kanid soils also occur on hillsides with slopes between 35 to 50 percent.

Douglas-fir is the single most abundant tree specie. Mixed with Douglas-fir is ponderosa and sugar pine, incense cedar and madrone. Ground cover includes poison oak, hazel, canyon live oak and grasses. In recent cutover areas, slickleaf (Ceanothus velutinus) will grow on the better sites, deer brush (Ceanothus integerrimus) occupies the next best sites while canyon live oak grows on the poorest sites.

9. Beekman (371) - Vermisa (372) Association
35 to 90 percent slopes

This association occurs on Umpqua sandstone and siltstone and on the Dothan and Galice Formations that have slightly metamorphosed sandstone, siltstone and andesite. It is an area that receives 30 to 50 inches of annual precipitation.

Beekman soils occupy about 40 percent of the association. They are found on slopes from 50 to 90 percent. They occur on steep sideslopes, narrow ridge tops and steep ridge noses. Vermisa soils occupy about 30 percent of the association. They are found on very steep sideslopes, canyon walls, very narrow ridge tops, and headwalls.

Inclusions of Pollard, Kanid and McGinnis occur throughout the association at random.

Douglas-fir is the single most abundant tree specie. Mixed with it are ponderosa pine, sugar pine, incense cedar and madrone. Ground cover includes poison oak, hazel, ocean spray, canyon live oak and grasses. In recent cutover areas, deer brush (Ceanothus integerrimus) will grow on Beekman and Pollard soils while canyon live oak grows on Vermisa soils.

10. Pearsoll (770) - Cornutt (771) - Association
35 to 90 percent slopes

This association occurs on serpentine and peridotite rocks in areas receiving 30 to 40 inches of annual precipitation.

Pearsoll soils occupy about 40 percent of the association. They occur on steep sideslopes with slope gradients of 60 to 90 percent. Cornutt soils occur on gently sloping topography with slope gradients of 0 to 60 percent. Rock land occurs with Pearsoll on steep and very steep soils. The remainder of the association are inclusions of deep, red, clayey soils on Nickle Mountain and deep, black, clayey soils on benches along Cow Creek.

Jeffrey pine and ponderosa pine are the two most dominant tree species. Stunted incense cedar does occur. The ground cover includes grasses, mountain white thorn (Ceanothus corduladous), wedge leaf (Ceanothus cuniatus) and poison oak.

11. Holland (722) - Lettia (724) - Siskiyou (721) Association
35 to 65 percent slopes

This association occurs on granite-diorite rock locally known as "decomposed granite." Precipitation is 30 to 50 inches.

Holland soils occupy about 50 percent of the association. They are found on slopes of 20 to 90 percent. Most frequently they are on steep sidehills and narrow ridge tops. Lettia soils are on gently sloping topography in the Myrtle Creek drainages. Siskiyou soils are found on steep and very steep sideslopes and headwalls. These soils are found near the Roseburg-Medford BLM boundary and in McKay Creek.

Inclusions of Barron soils occur in the Stouts Creek drainage. Barron is a deep sandy loam soil on slopes of 20 to 30 percent.

Douglas-fir is the most abundant specie. Incense cedar, ponderosa pine and knobcone pine do occur. The ground cover includes poison oak, scattered salal, ocean spray and Oregon grape. Deer brush (Ceanothus integerrimus) will grow well after cutting and burning on Holland and Lettia soils.

12. Lettia (724m) - Holland (722m) Association
35 to 65 percent slopes

This association occurs on old metavolcanic rocks such as gneiss in areas receiving 30 to 50 inches of rainfall.

Lettia soils occupy about 60 percent of this association. They are found on the gently sloping topography such as broad ridge tops and gentle sideslopes. Holland soils occupy about 40 percent of the association. These soils are on steep sideslopes and narrow ridge tops.

Inclusions of Selmac and Abegg soils do occur. Selmac is a wet, clayey soil found in the creek bottoms of Weaver Creek and Louie Creek. Abegg soils are found on the very steep slopes and in headwalls.

Douglas-fir is the most abundant specie. Incense cedar, ponderosa pine and madrone also occur. The ground cover includes poison oak, grasses, ocean spray, hazel and manzanita. Deer brush (Ceanothus integerrimus) will become established following a burn.

13. Freezner (741) - Vena (731) Association
10 to 65 percent slopes

This association occurs on volcanic rocks of the Little Butte and Colestin Formations in areas receiving 30 to 50 inches annual precipitation.

Freezner soils occupy about 40 percent of the association. They are on the gently sloping topography such as broad rounded ridge tops and old slumps. Vena soils occur on steep slopes with slope gradients of 50 to 90 percent. The remainder of the association has inclusions of Shippa soils and rock land.

Douglas-fir is the most abundant specie. Sugar pine, ponderosa pine, incense cedar and madrone occur frequently. The ground cover includes grasses, poison oak, salal and manzanita. Slickleaf (Ceanothus velutinus) grows well after clearcutting and burning on the Freezner soils, while deer brush becomes established in Vena soils.

14. Freezner (741) - Chamate (362) - Shippa (732) Association
10 to 90 percent slopes

This association occurs on volcanic rocks of the Little Butte and Colestin Formations in areas of annual precipitation of 30 to 50 percent.

Freezner soils occupy about 45 percent of the association. They are on the gently sloping topography such as broad ridge tops and gentle sideslopes. Chamate soils occupy about 35 percent of the unit. They occur at the base of escarpments of welded tuffs. Shippa soils occupy about 20 percent of the association. They occur on very steep sidehills and headwalls.

The inclusions are Darby and Vena soils. Darby soils are deep, black, clayey soils in the High Point area. Vena soils are moderately deep, gravelly loam soils and occur on steep slopes.

Douglas-fir is the most abundant specie. Sugar pine, ponderosa pine, incense cedar and grand fir are mixed with the Douglas-fir. The ground cover includes grasses, poison oak, salal, scattered red huckleberry and manzanita. Deer brush grows well on the Freezner and Chamate soils. It does not grow well on Shippa soils.

D. Genetic Key to the Soil Series

For this report to be of any practical use, the man on the ground has to be able to identify soils. Table 7 is a key to help do this. Soil moisture, soil temperature, color and texture of the subsoil, soil depth, parent material and degree of soil profile development are the main factors used in the key. The strongly developed soils have an argillic horizon, which is a subsoil horizon enriched in clay. The weakly developed soils generally have a cambic horizon, which is a subsoil horizon that is not enriched in clay but has developed soil structure. Orchic epipedons are light colored surface layers relatively low in organic matter content. Umbric epipedons are dark colored surface horizons that are relatively low in exchangeable bases. Mollic epipedons are dark colored surface horizons that are relatively high in exchangeable bases. Pachic horizons are mollic horizons thicker than 20 inches. The key also shows the major physiographic province in which the soils commonly occur, and the landscape position on which they generally are located.

Table 7

Genetic Key to the Soil Series

Soil Series	Depth to Rock (in)	Epipedon	Subsoil Horizon Kind	Color	Texture	Landscape Position	Remarks
1.0 XERIC-MESIC SOILS							
1.1 From Volcanic Rocks in the Cascade Mountains and the Coast Range							
Shippa (732)	10-20	Ochric	Cambic	Brown	Loamy-Skeletal	Very Steep Slopes	Lithic Contact
Witzel (36)	10-20	Mollic	Cambic	Reddish Brown	Loamy-Skeletal	Moderate to Very Steep Slopes	Lithic Contact
Vena (731)	20-40	Ochric	Cambic	Brown	Loamy-Skeletal	Steep to Very Steep Slopes	
Ritner (24)	20-40	Ochric	Cambic	Reddish Brown	Clayey-Skeletal	Steep to Very Steep Slopes	
Bellpine (13,13t)	20-40	Umbric	Argillic	Red	Clayey	Gentle to Moderate Slopes	Paralithic Contact 13t is over Tuff
Nekia (23)	20-40	Umbric	Argillic	Red	Clayey	Gentle to Moderate Slopes	Lithic Contact
Chamate (362)	40-60	Ochric	Cambic	Brown	Loamy-Skeletal	Moderate to Very Steep Slopes	
Freezner (741)	40-60	Ochric	Argillic	Red	Clayey	Gentle to Steep Slopes	Relatively High Base Status
Jory (12,12t)	40-60	Umbric	Argillic	Red	Clayey	Gentle to Moderate Slopes	Low Base Status 12t is over Tuff
Darby (397)	40-60	Pachic	Argillic	Brown	Clayey	Moderate to Steep Slopes	

Table 7 (cont.)

Genetic Key to the Soil Series

Soil Series	Depth to Rock (in)	Epipedon	Subsoil Horizon Kind	Subsoil Horizon Color	Subsoil Horizon Texture	Landscape Position	Remarks
1.0 XERIC-MESIC SOILS (continued)							
1.2 From Sedimentary Rocks in the Coast Range							
Larmine (393)	10-20	Ochric	Cambic	Brown	Loamy-Skeletal	Very Steep Slopes	Lithic Contact
Atring (394)	20-40	Ochric	Cambic	Brown	Loamy-Skeletal	Steep to Very Steep Slopes	
Renhaven (395)	40-60	Ochric	Cambic	Brown	Fine-Loamy	Moderate to Steep Slopes	
Bateman (396)	40-60	Ochric	Argillic	Reddish Brown	Clayey	Gentle to Moderate Slopes	
1.3 From Metasedimentary and Sedimentary Rocks in the Klamath Mountains							
Vermisa (372)	10-20	Ochric	Cambic	Brown	Loamy-Skeletal	Steep to Very Steep Slopes	Lithic Contact
Beekman (371)	20-40	Ochric	Cambic	Brown	Loamy-Skeletal	Steep to Very Steep Slopes	
Kanid (370)	40-60	Ochric	Cambic	Brown	Loamy-Skeletal	Moderate to Steep Slopes	
McGinnis (381)	20-40	Ochric	Argillic	Red	Clayey-Skeletal	Moderate to Steep Slopes	
Tishar (382)	40-60	Ochric	Argillic	Red	Clayey-Skeletal	Moderate to Steep Slopes	

Table 7 (cont.)

Genetic Key to the Soil Series

Soil Series	Depth to Rock (in)	Epipedon	Subsoil Horizon Kind	Subsoil Horizon Color	Subsoil Horizon Texture	Landscape Position	Remarks
1.0 XERIC-MESIC SOILS (continued)							
1.3 From Metasedimentary and Sedimentary Rocks in the Klamath Mountains (continued)							
Pollard (380)	40-60	Ochric	Argillic	Red	Clayey	Gentle to Moderate Slopes	
1.4 From Granitic and Metavolcanic Rocks in the Klamath Mountains							
Siskiyou (721)	20-40	Ochric	Cambic	Brown	Coarse-Loamy	Moderate to Very Steep Slopes	
Barron (723)	40-60	Ochric	Cambic	Brown	Coarse-Loamy	Gentle to Moderate Slopes	
Holland (722,722m)	40-60	Ochric	Argillic	Reddish Brown	Fine-Loamy	Moderate to Very Steep Slopes	722m is over Metavolcanic Rocks
Abegg (360)	40-60	Ochric	Argillic	Reddish Brown	Loamy-Skeletal	Moderate to Very Steep Slopes	Mostly from Metavolcanic Rocks
Lettia (724,724m)	40-60	Ochric	Argillic	Red	Clayey	Gentle to Moderate Slopes	724m is over Metavolcanic Rocks
Selmac (743)	40-60	Ochric	Argillic	Mottled Reddish Brown	Fine-Loamy over Clayey	Gentle to Moderate Slopes	Moderately Well Drained

Table 7 (cont.)

Genetic Key to the Soil Series

Soil Series	Depth to Rock (in)	Epipedon	Subsoil Horizon Kind	Color	Texture	Landscape Position	Remarks
1.0 XERIC-MESIC SOILS (continued)							
1.5 From Serpentine							
Pearsoll (770)	10-20	Ochric	Cambic	Red	Clayey-Skeletal	Steep to Very Steep Slopes	Lithic Contact
Cornutt (771)	20-40	Ochric	Argillic	Red	Clayey	Moderate to Steep Slopes	
2.0 XERIC-FRIGID SOILS							
From Sedimentary Rocks in the Coast Range and the Klamath Mountains							
Skymor (825)	10-20	Ochric	Cambic	Brown	Loamy-Skeletal	Gentle to Very Steep Slopes	Paralithic Contact
Jayar (824)	20-40	Ochric	Cambic	Brown	Loamy-Skeletal	Gentle to Steep Slopes	
3.0 UDIC-MESIC SOILS							
3.1 From Volcanic Rocks and Tuffs in the Cascade Mountains							
Zango (70)	10-20	Ochric	Cambic	Brown	Loamy-Skeletal	Steep to Very Steep Slopes	Lithic Contact
Kilchis (35)	10-20	Umbric	Cambic	Red	Loamy-Skeletal	Steep to Very Steep Slopes	Lithic Contact
Twindar (53,53s)	20-40	Ochric	Cambic	Brown	Loamy-Skeletal	Steep to Very Steep Slopes	53s has Thick Gravelly Mantle

Table 7 (cont.)

Genetic Key to the Soil Series

Soil Series	Depth to Rock (in)	Epipedon	Subsoil Horizon Kind	Subsoil Horizon Color	Subsoil Horizon Texture	Landscape Position	Remarks
3.0 UDIC-MESIC SOILS (continued)							
3.1 From Volcanic Rocks and Tuffs in the Cascade Mountains (continued)							
Harrington (29)	20-40	Umbric	Cambic	Red	Loamy-Skeletal	Steep to Very Steep Slopes	
Klickitat (323)	40-60	Umbric	Cambic	Red	Loamy-Skeletal	Moderate to Steep Slopes	
Blachly (10)	40-60	Ochric	Cambic	Red	Clayey	Gentle to Steep Slopes	Also from Sedimentary Rock Colluvium
Peavine (20t)	20-40	Umbric	Argillic	Red	Clayey	Gentle to Steep Slopes	Also from Sedimentary Rock Colluvium
Honeygrove (14t)	40-60	Umbric	Argillic	Red	Clayey	Gentle to Moderate Slopes	Also from Sedimentary Rock Colluvium
Shivigny (300)	40-60	Umbric	Argillic	Red	Clayey-Skeletal	Gentle to Moderate Slopes	
3.2 From Sedimentary Rocks in the Coast Range							
Umpcoos (564)	10-20	Ochric	Cambic	Brown	Loamy-Skeletal	Steep to Very Steep Slopes	Lithic Contact
Jason (64)	10-20	Ochric	Cambic	Brown	Loamy-Skeletal	Steep to Very Steep Slopes	Paralithic Contact

Table 7 (cont.)

Genetic Key to the Soil Series

Soil Series	Depth to Rock (in)	Epipedon	Subsoil Horizon			Landscape Position	Remarks
			Kind	Color	Texture		
3.0 UDIC-MESIC SOILS (continued)							
3.2 From Sedimentary Rocks in the Coast Range (continued)							
Digger (66)	20-40	Ochric	Cambic	Brown	Loamy-Skeletal	Steep to Very Steep Slopes	
Preacher (57)	40-60	Umbric	Cambic	Brown	Fine-Loamy	Moderate to Steep Slopes	
Blachly (10)	40-60	Ochric	Cambic	Red	Clayey	Gentle to Steep Slopes	Also from Tuff Colluvium
Peavine (20x)	20-40	Umbric	Argillic	Red	Clayey	Gentle to Steep Slopes	Also from Tuff Colluvium
Honeygrove (14x)	40-60	Umbric	Argillic	Red	Clayey	Gentle to Moderate Slopes	Also from Tuff Colluvium
Apt (50)	40-60	Umbric	Argillic	Brown	Clayey	Gentle to Moderate Slopes	
4.0 UDIC-FRIGID SOILS							
From Volcanic Rocks in the Cascade Mountains							
Winberry (410)	10-20	Ochric	Cambic	Brown	Loamy-Skeletal	Gentle to Very Steep Slopes	
Holderman (400)	20-40	Ochric	Cambic	Brown	Loamy-Skeletal	Gentle to Very Steep Slopes	
Cruiser (19)	40-60	Ochric	Cambic	Red	Fine-Loamy	Gentle to Moderate Slopes	

IV. DESCRIPTION OF SOIL SERIES AND MAPPING UNITS

This section includes descriptions of the soil series, miscellaneous land types and mapping units occurring in the Roseburg District. Mapping units are listed under the soil series for which they are named. For mapping units containing more than one soil series the mapping units are listed under the dominant series. The soil series are listed in numerical order with respect to their map symbol.

Descriptions of the soil series give the physiographic and environmental setting of the soils, a brief listing of important soil characteristics, the soils associated with soils of each series, and soil behavior and management recommendations. More detailed technical soil descriptions are given in the section on soil classification and morphology.

Descriptions of the mapping units give the acreage, the proportions of the major soils, the dominant slope gradients, the soil pattern, and the inclusions of soils of minor extent. Generally, soils making up less than 20 percent of the area in each delineation are considered inclusions. The proportions given for soil associations are broad averages for all delineations of a given association, and any one delineation may vary as much as 10 percent from this average. For example, a mapping unit consisting of soils of two series described as having proportions of 60 percent soil A and 40 percent soil B, may have some delineations in which soil A makes up between 50 and 70 percent and soil B makes up 30 to 50 percent of the area.

Table 8 lists the soil series and miscellaneous land types and gives the map symbol for each. The letters attached to some of the numerical series symbols depict the kind of underlying bedrock. They are: "m" for metavolcanic rocks; "t" for tuff; and "x" for sedimentary rocks. The 53s soils have a thick surface mantle of gravelly debris.

The map symbols for slope gradient phases and slope aspect phases are given in Table 9. The northerly aspects were separated on the soil map only in areas where aspect has a significant effect on forest regeneration. The warmer portions of the Dillard and South Umpqua Resource Areas generally have fewer problems in forest rehabilitation on the northerly facing slopes than they do on the southerly slopes. Table 10 also defines the soil depth classes in inches that are referred to by descriptive terms in the following soil descriptions.

Table 8

Soil Series and Miscellaneous Land Types and
Their Respective Map Symbols

Symbol	Series or Miscellaneous Land Type	Symbol	Series or Miscellaneous Land Type	Symbol	Series or Miscellaneous Land Type
1	Mixed Alluvial Land	57	Preacher	397	Darby
R	Rock Land	64	Jason	400	Holderman
10	Blachly	66	Digger	410	Winberry
12	Jory, Hard Volcanic	70	Zango	564	Umpcoos
12x	Jory, Sedimentary	300	Shivigny	721	Siskiyou
12t	Jory, Tuff	323	Klickitat	722	Holland
13	Bellpine	360	Abegg	722m	Holland, Metavolcanic
13t	Bellpine, Tuff	362	Chamate	723	Barron
14t	Honeygrove, Tuff	370	Kanid	724	Lettia
14x	Honeygrove, Sedimentary	371	Beekman	724m	Lettia, Metavolcanic
19	Cruiser	372	Vermisa	731	Vena
20t	Peavine, Tuff	380	Pollard	732	Shippa
20x	Peavine, Sedimentary	381	McGinnis	741	Freezner
23	Nekia	382	Tishar	743	Selmac
24	Ritner	393	Larmine	770	Pearsoll
29	Harrington	394	Atring	771	Cornutt
35	Kilchis	395	Renhaven	824	Jayar
36	Witzel	396	Bateman	825	Skymor
50	Apt				Granite Pockets
53	Twindar				
53s	Twindar, Surface Mantle				

Table 9

Definitions of Slope Gradient, Slope Aspect, and Soil Depth Classes

Slope Gradient Symbol	Percent Range	Slope Gradient Class Name	Slope Aspect Symbol	Slope Aspect Name
V	0-10	Gently Sloping	None	Southerly
W	10-35	Moderately Steep	n	Northerly
X	35-65	Steep		
Y	65-90	Very Steep		
Soil Depth (inches)		Descriptive Term		
0-10		Very Shallow		
10-20		Shallow		
20-40		Moderately Deep		
40-60		Deep		
60+		Very Deep		

Table 10. Percentage of Soil Series in the District

Map Symbol	Soil Name	Percent of BLM Acres
1	Mixed Alluvial Land	0.32
10	Blachly	0.62
12	Jory	4.26
13	Bellpine	0.617
14	Honeygrove	5.6402
19	Cruiser	0.31
20	Peavine	1.06
23	Nekia	0.323
24	Ritner	0.23
29	Harrington	2.08
35	Kilchis	1.02
36	Witzel	0.29
50	Apt	1.09
53	Twindar	0.83
53s	Twindar	0.10
57	Preacher	2.65
64	Jason	3.07
66	Digger	4.7062
70	Zango	0.61
300	Shivigny	1.37
323	Klickitat	1.68
360	Abegg	0.77
362	Chamate	0.67
370	Kanid	3.00
371	Beekman	11.4662
372	Vermisa	6.9972
380	Pollard	3.39
381	McGinnis	3.53
382	Tishar	3.26
393	Larmine	2.57
394	Atring	3.90
395	Renhaven	5.3462
396	Bateman	2.24
397	Darby	0.24
400	Holderman	2.18
410	Winberry	1.06
564	Umpcoos	0.13
721	Siskiyou	0.77
722	Holland	2.22
722m	Holland	1.52
723	Barron	0.40
724	Lettia	1.05
724m	Lettia	0.96
731	Vena	2.61
732	Shippa	0.924
741	Freezner	2.23
743	Selmac	0.26
770	Pearsoll	0.79
771	Cornutt	0.39
824	Jayar	0.21
825	Skymor	0.12
R	Rock Land	1.92

1% = 4,071.31 acres

Small Granite Pocket

These are small areas, usually less than 15 acres, of soils derived from decomposed granite. They are too small to have a symbol, but are important. The presence of these pockets on the map is meant to alert the land manager that the area is intersperced with islands of granite which could cause problems in road construction.

The soils in these pockets are a mixture of Siskiyou, Holland, and Barron.

Rock Land (R), 0 to 90+ Percent Slopes

This is a miscellaneous land type consisting of rock outcrop and soil less than 10 inches deep. Rock land may offer some light grazing. Trees are usually sparse and scrubby even where the climatic and other conditions are favorable.

Figure 8. Rock land is not dominant in any of the mapping units. It occurs as a secondary or tertiary soil in mapping units of the Ritner, Kilchis, Witzel, Jason, Digger, Zango, Vermisa, Atring, Pearsoll and Cornutt series.

MIXED ALLUVIAL LAND (1)

This mapping unit, a miscellaneous land type, encompasses all the flood plains and alluvial bottom lands within the mapping area. These areas are dominated by deep, well-drained soils which occupy nearly level to gently undulating surfaces; and deep, moderately well-drained to poorly-drained soils occurring on nearly level and depressional areas on flood plains and low terraces. Surface textures are predominately a silty clay or silty clay loam.

These lands are used for timber production, recreation, and wildlife. The general factors limiting timber production would be location having a high seasonal water table and flooding hazard. Those limiting recreation include excessive wetness, frequent flooding, very slow permeability, clayey surface textures and rockiness. Alluvial bottom lands and flood plains offer a unique and preferred habitat for many kinds of wildlife.

Mapping Units:

1/V	Mixed alluvial land, 0 to 10 percent slopes. 10,605 acres, This mapping unit is predominately mixed alluvial land on flood plains and alluvial fans. Mingled with the alluvial land are minor inclusions of soils on adjacent uplands of the Apt, Honeygrove, Jory, Klickitat, Kanid, Pollard, Renhaven, Holland, Barron, Lettia, Freezner, and Preacher series.

Figure 9. Blachly soils are easily reforested. They are highly productive soils supporting thrifty stands of Douglas-fir.

BLACHLY SERIES (10)

The Blachly series consists of deep, red, clayey soils formed in fine-textured colluvium from sedimentary and volcanic rocks in areas receiving from 60 to 100 inches of precipitation. They occur on ridgetops and sideslopes in the Cascade Mountains at elevations of 1800 to 3200 feet.

Profile Description: Blachly silty clay loam

Surface Soil:	0 to 8"	Dark reddish brown silty clay loam, friable, very strongly acid, (5 to 10 inches thick).
Subsoil:	8 to 66"	Yellowish red silty clay, firm, very strongly acid, (32 to 70 inches thick).
Substratum:	66+"	Partially weathered volcanic rocks.
Representative Profile:	NE¼, NW¼, Sec. 24, T. 24 S., R. 2 W., on the 24.0 road.	

Variations: Depth to bedrock ranges from 5 to over 12 feet. The amount of rock fragments ranges from one to 20 percent in the upper part and from 20 to 50 percent below 5 feet. The color of the surface soil is dark reddish brown or dark brown. The texture of the surface soil is clay loam, silty clay loam, or clay. The color of the subsoil is yellowish red, reddish brown, red or dark red. The texture of the subsoil is silty clay or clay.

Setting: Blachly soils are on gently sloping broad ridgetops, and sideslopes with gradients up to 50 percent in the Cascade Mountains at elevations of 2500 to 3200 feet. The soils developed in very deep, fine-textured colluvium from volcanic rocks. The winters are cool and moist, and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for less than 45 days during the summer. Mean annual precipitation ranges from 60 to 90 inches. Average annual temperature is 45° to 53° F., average January temperature is 38° to 40° F., and average July temperature is 60° to 66° F. The average frost-free period is 160 to 210 days. The native vegetation is dominantly Douglas-fir with some hemlock and cedar. The understory is mixed shrubs and herbs such as vine maple, salal, sword fern and ocean spray.

Blachly soils are associated with soils of the deep, loamy-skeletal Klickitat series; the moderately deep, loamy-skeletal Harrington series; and the shallow, loamy-skeletal Klichis series. The Blachly series merge with the more strongly developed, red, clayey, Honeygrove soils, and the red, clayey-skeletal Shivigny soils on the lower footslopes. At higher elevations, the Blachly soils merge with the frigid, red, fine-loamy Cruiser soils.

Soil Behavior and Recommendations:

Blachly soils support productive stands of Douglas-fir with some western red cedar, hemlock, sugar pine and western white pine. The average site index is 149 for northerly aspects and 149 for southerly aspects. The stand density is usually normal for Douglas-fir which is evident in Figure 9.

Clearcutting is the recommended harvesting practice for Blachly soils. These soils occur in moist environments where the growth of Douglas-fir is good. Aspect does not play a strong role in tree growth on Blachly soils. Competing vegetation is usually not a problem. Occasionally a very dense stand of Ceanothus velutinus will get established after a hot burn. If the Douglas-fir does not get established the first two years after the burn, the ceanothus can be a strong competition. Recommendations are to control the density of the ceanothus by spot burning or seeding and to get the Douglas-fir established the first year after harvesting.

For areas that have heavy stands of ceanothus with little or no Douglas-fir stocking, the recommendations are to use herbicides, mechanical scarification, and plant.

Blachly soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Blachly soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12-15 inches apart during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Blachly soils have a high water holding capacity. The low amount of coarse fragments, the clay loam texture of the surface soil plus the clay texture of the upper part of the subsoil, and the high organic matter content all blend together to produce a water holding capacity that is between 4.5 and 5.5 inches. This amount of moisture is adequate for the survival of bare-root Douglas-fir seedlings in a clearcut. The success of bare-root Douglas-fir seedlings is high.

Burning slash does not produce a significant increase in erosion on Blachly soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendations are to spot burn wherever possible.

Blachly soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10 year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendations are to seed units in Blachly soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10 year period, the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Blachly soils. The material below the soil is usually soft, highly weathered volcanic rocks. Cut bank stability is high on slopes less than 35 percent and low on slopes over 35 percent. The most common failure is slumping of cut banks. They fill the ditch and part of the road.

Blachly soils commonly occur on gentle, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the back slopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Blachly soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Blachly soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Fire trails that are built by hand result in little disturbance. If tractors must be used to construct fire trails, then build closely spaced waterbars.

Blachly soils are well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 10 inches of compacted subsoil is adequate.

Mapping Units:

10-29/WX — Blachly silty clay loam - Harrington gravelly loam association, 10 to 65 percent slopes. 906 acres. Deep, red, clayey Blachly soils make up about 70 percent of the area; and moderately deep, red loamy-skeletal Harrington soils make up about 30 percent of the area. The Blachly soils are mostly on rounded ridgetops, ridge noses, and slump benches. The Harrington soils are mostly on the steeper sideslopes and slump escarpments. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Blachly soils are minor inclusions of the strongly developed Honeygrove and Peavine soils. Mingled with the Harrington soils are minor inclusions of the deep, loamy-skeletal Klickitat series.

10-323/W — Blachly silty clay loam - Klickitat gravelly loam association, 10 to 35 percent slopes. 2909 acres. Deep, red, clayey Blachly soils make up about 70 percent of the area; and deep, loamy-skeletal Klickitat soils make up about 30 percent of the area. The Blachly soils are mostly on rounded ridgetops, ridge noses, and old slump benches. The Klickitat soils are mostly on the steeper sideslopes, and recent slump benches. Mingled with the Blachly soils are minor inclusions of the strongly developed Honeygrove and Peavine soils. Mingled with the Kilckitat soils are minor inclusions of the moderately deep Harrington soils and the shallow Kilchis soils, as well as the light surface layered Twindar and Zango soils.

10-323/WX — Blachly silty clay loam - Klickitat gravelly loam association, 10 to 65 percent slopes. 635 acres. Deep, red, clayey Blachly soils make up about 70 percent of the area; and deep, loamy-skeletal Klickitat soils make up about 30 percent of the area. The Blachly soils are mostly on rounded ridgetops, ridge noses, and old slump benches. The Klickitat soils are mostly on the steeper sideslopes and recent slump benches. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 60 percent. Mingled with the Blachly soils are minor inclusions of the strongly developed Honeygrove and Peavine soils. Mingled with the Klickitat soils are minor inclusions of the moderately deep Harrington soils and the shallow Kilchis soils, as well as the light surface layered Twindar and Zango soils.

10-323/X

Blachly silty clay loam - Kilckitat gravelly loam association, 35 to 65 percent slopes. 1266 acres. Deep, red, clayey Blachly soils make up about 60 percent of the area; and deep, loamy-skeletal Klickitat soils make up about 40 percent of the area. The Blachly soils are mostly on rounded ridgetops, ridge noses, and old slump benches. The Klickitat soils are mostly on the steeper sideslopes, and recent slump benches. Mingled with the Blachly soils are minor inclusions of the strongly developed Honeygrove and Peavine soils. Mingled with the Klickitat are minor inclusions of the moderately deep Harrington soils and the shallow Kilchis soils, as well as the light surface layered Twindar and Zango soils.

JORY SERIES (12)

The Jory series consists of deep, well-drained, clayey soils formed in colluvium derived from volcanic and sedimentary rocks in areas receiving from 30 to 50 inches of precipitation. They are found on gently sloping to steep slopes in the Coast Range and Cascade Mountains at elevations of 400 to 2500 feet.

Profile Description: Jory silty clay loam

Surface Soil:	0 to 19"	Dark reddish brown silty clay loam, friable, medium acid, (16 to 26 inches thick).
Subsoil:	19-100+	Dark reddish brown clay, very firm, strongly acid, (30 to 150 inches thick).
Representative Profile:	NE¼, NE¼, Sec. 18, T. 24 S., R. 7 W., on road 24-7-18.0, 120 feet north of its junction with road 24-7-17.2.	

Variations: The depth to bedrock is over 40 inches and is usually over 5 feet. Coarse fragments normally range up to 20 percent in the profile. The surface layer has moist colors which are predominately dark reddish brown and dry colors ranging from reddish brown, yellowish red, to red. It is a silty clay to clay loam. The subsoil has moist colors ranging from dark reddish brown to dark red and dry colors ranging from reddish brown and yellowish red to red. It is clay loam to clay.

Setting: The landscape on which Jory soils are found is represented by broad, gently to moderately steep, rounded ridge noses, rolling foothills, and moderately steep sideslopes at elevations predominately under 2500 feet. The sideslopes where these soils are found have a moderately dense stream dissection pattern and have gradients predominately less than 60 percent.

The summers are warm and dry and the winters are cool and moist. Mean annual precipitation ranges from 30 to 50 inches. The mean annual air temperature is 50° to 54° F., and the frost-free season is 165 to 210 days.

The native vegetation found on Jory soils is mainly Douglas-fir with an associated understory of poison oak, ocean spray, hazel, salal, and Oregon grape. On south and southwest exposures, incense cedar, white oak and pacific madrone are found associated with Douglas-fir in the overstory. On slopes having a history of repeated burning and soil disturbance, bracken fern and native grasses offer a dense cover.

The Jory soils are associated with soils of the moderately deep Bellpine series over sedimentary rocks; the moderately deep Nekia series over basalt; the deep, clayey, light surface layered Bateman series; the fine-loamy Renhaven series; and the loamy-skeletal Atring series.

Soil Behavior and Recommendations (Jory soils over sediments):

Jory soils support productive stands of Douglas-fir with some incense cedar and grand fir. The average site index is 135. The stand density is usually normal for Douglas-fir.

Clearcutting is the recommended harvesting practice for Jory soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on low elevation, southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 2 years following planting.

Jory soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of logging on Jory soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped when the soil is the driest. Generally ripping to a depth of 12 inches with teeth that are 12 to 15 inches apart will be adequate.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred frequently.

The upper 20 inches of Jory soils have a high water holding capacity. The low amount of coarse fragments, the clay loam texture of the A horizon, and high organic matter content all blend together to produce a water holding capacity that is between 4.5 and 5.5 inches. This amount of moisture is adequate for bare-root stock in a clearcut. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully the survival of seedlings will be high. Shading is not needed on Jory soils.

Burning slash does not produce a significant increase in erosion. Losses of inorganic potassium and phosphorous are very small. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendations are to spot burn wherever possible and seed units lightly with Ceanothus velutinus (see Figure 10). A density of 600 ceanothus plants per acre is optimum. This specie fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Some of these benefits can be seen in Figure 4. Over a 10-year period this plant can produce 400 to 700 pounds of nitrogen per acre. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Jory soils. The material below the soil is usually soft, highly weathered sandstone or siltstone. Cut bank stability is high on slopes less than 35 percent and low on slopes over 35 percent. The most common failures are small slumps that fill ditches.

Jory soils commonly occur on gentle, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go through a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the back slopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Jory soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Rocking new roads is recommended and is a necessity if winter hauling is planned.

Jory soils are well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 10 inches of compacted subsoil is adequate.

Hand built fire trails have the least impact on the soil. If tractors must be used to construct fire trails, then build closely spaced water bars.

Soil Behavior and Recommendations (Jory soils over basalt):

All the statements for Jory soils over sediments apply to Jory soils over basalt with the following exceptions:

1. Road construction is frequently more difficult because the weathered basalt under the soil is harder to rip. Occasionally blasting is necessary.

Figure 10. Ceanothus velutinus, like other ceanothus species, has three main veins in the leaf. The upper leaf surface has a waxy, sticky, aromatic, coating which is responsible for several of its names such as "slickleaf" and "sticky leaf laurel."

Figure 11. Shows the height of Douglas-fir seedlings of the same age in an 8-year old clearcut. The white squares at the top of the leaders show there is a 3 foot difference between seedlings growing in the open and the one in the middle of the clump. This is due to mechanical protection from browsing, increase of available nitrogen, and shade.

2. There are fewer old landslides in areas where Jory soils occur over basalt.

Soil Behavior and Recommendations (Jory soils over tuffs and breccias):

All the statements for Jory soils over sediments apply to Jory soils over tuffs and breccias with the following exceptions:

1. Jory soils over tuffs and breccias contain more expanding type clays than do Jory soils over sediments or basalt. Sediment coming from disturbed areas tends to stay in suspension longer. Recommendation is to rock all new mainline roads. Spur roads need to be rocked or ripped, seeded, mulched, and fertilized.

2. When these soils are ripped following compaction from tractor logging, the compacted layers break up faster.

3. Extra road rock is needed on new fills made from these soils. Experience has shown that 16 to 24 inches of rock is needed depending on the quality of rock and amount of traffic.

Mapping Units:

12x/W	Jory silty clay loam, 10 to 35 percent slopes. 134 acres. Jory soils predominately occur on low rolling foothills underlain by sedimentary rocks with minor inclusions of Bellpine and Renhaven soils on the steeper slopes.
12x-13/V	Jory silty clay loam - Bellpine silty clay loam association, 0 to 10 percent slopes. 361 acres. Deep Jory soils make up about 70 percent of the area, and moderately deep Bellpine soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Bellpine soils are mostly on ridge crests and on slope breaks. Minor inclusions of Atring soils are mingled with the Bellpine soils.
12x-13/WV	Jory silty clay loam - Bellpine silty clay loam association, 0 to 35 percent slopes. 300 acres. Deep Jory soils make up about 70 percent of the area, and moderately deep Bellpine soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Bellpine soils are mostly on ridge crests and on slope breaks. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 0 and 10 percent. Minor inclusions of Atring soils are mingled with the Bellpine soils on the steeper slopes.

12-13/W — Jory silty clay loam - Bellpine silty clay loam association, 10 to 35 percent slopes. 2854 acres. Deep Jory soils make up about 70 percent of the area, and moderately deep Bellpine soils make up about 30 percent of the area. The Bellpine soils are underlain by sedimentary rocks. The Jory soils are mostly on smooth rolling hills. The Bellpine soils are on the steeper sideslopes and along slope breaks. Minor inclusions of Bateman soils are mingled with the Jory soils. Minor inclusions of the loamy-skeletal Atring and Larmine soils are mingled with the Bellpine soils.

12x-13/W — Jory silty clay loam - Bellpine silty clay loam association, 10 to 35 percent slopes. 9135 acres. Deep Jory soils make up about 70 percent of the area, and moderately deep Bellpine soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Bellpine soils are mostly on ridge crests and on slope breaks. Minor inclusions of Atring soils are mingled with the Bellpine soils on the steeper slopes.

12t-13t/WX — Jory silty clay loam - Bellpine silty clay loam association, 10 to 65 percent slopes. 1155 acres. Deep Jory soils make up about 70 percent of the area, and moderately deep Bellpine soils make up about 30 percent of the area. The Bellpine soils are mostly on the steeper sideslopes and along slope breaks. These soils are underlain by tuffaceous rocks. About 70 percent of the area has slope gradients between 10 and 35 percent, and about 30 percent has gradients between 35 and 65 percent. Minor inclusions of loamy-skeletal, Atring soils are mingled with the Bellpine soils on the steeper slopes.

12x-13/WX — Jory silty clay loam - Bellpine silty clay loam association, 10 to 65 percent slopes. 1608 acres. Deep Jory soils make up about 70 percent of the area, and moderately deep Bellpine soils make up about 30 percent of the area. The Bellpine soils are mostly on the steeper sideslopes and along slope breaks. These soils are underlain by sedimentary rocks. About 70 percent of the area has slope gradients between 10 and 35 percent, and about 30 percent has gradients between 35 and 65 percent. Minor inclusions of loamy-skeletal, Atring soils are mingled with the Bellpine soils on the steeper slopes.

12x-13/XW	Jory silty clay loam - Bellpine silty clay loam association, 10 to 65 percent slopes. 691 acres. Deep Jory soils make up about 70 percent of the area, and moderately deep Bellpine soils make up about 30 percent of the area. The Bellpine soils are mostly on the steeper sideslopes and along slope breaks. These soils are underlain by sedimentary rocks. About 70 percent of the area has slope gradients between 35 and 65 percent, and about 30 percent has gradients between 10 and 35 percent. Minor inclusions of loamy-skeletal, Atring soils are mingled with the Bellpine soils on the steeper slopes.
12x-13/X	Jory silty clay loam - Bellpine silty clay loam association, 35 to 65 percent slopes. 376 acres. Deep Jory soils make up about 70 percent of the area and moderately deep Bellpine soils make up about 30 percent of the area. The Bellpine soils are mostly on the steeper sideslopes and along slope breaks. These soils are underlain by sedimentary rocks. About 70 percent of the area has slope gradients between 10 and 35 percent, and about 30 percent has gradients between 35 and 65 percent. Minor inclusions of the loamy-skeletal Atring soils are mingled with the Bellpine soils on the steeper slopes.
12x-13-396/X	Jory silty clay loam - Bellpine silty clay loam - Bateman silt loam association, 35 to 65 percent slopes. 736 acres. Deep Jory soils make up about 50 percent of the area; moderately deep Bellpine soils make up about 30 percent of the area; and deep, clayey, light surface layered Bateman soils make up about 20 percent of the area. The Bellpine soils generally occur on convex ridgetops and ridge noses. The Bateman soils are mixed with the Jory soils. The Jory soils are on the smooth sideslopes. Minor inclusions of Atring soils are mingled with the Bellpine soils, and minor inclusions of Renhaven soils are mingled with the Jory and Bateman soils.
12-23/W	Jory silty clay loam - Nekia clay loam association, 10 to 35 percent slopes. 6864 acres. Deep, red, clayey Jory soils make up about 70 percent of the area, and moderately deep, red, clayey, Nekia soils make up about 30 percent of the area. The Jory soils are mostly on rounded ridgetops and smooth sideslopes. The Nekia soils are mostly on the steeper uneven sideslopes. These soils are underlain by basalt. Mingled with the Nekia soils are minor inclusions of clayey-skeletal Ritner soils and shallow, loamy-skeletal Witzel soils.

12-12/WX	Jory silty clay loam - Nekia clay loam association, 10 to 65 percent slopes. 254 acres. Deep, red, clayey Jory soils make up about 70 percent of the area, and moderately deep, red clayey Nekia soils make up about 30 percent of the area. The Jory soils are mostly on rounded ridgetops and smooth sideslopes. The Nekia soils are mostly on the steeper uneven sideslopes. These soils are underlain by basalt. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Nekia soils are minor inclusions of clayey-skeletal Ritner soils, and shallow, loamy-skeletal Witzel soils.
12-23/X	Jory silty clay loam - Nekia silty clay loam association, 35 to 60 percent slopes. 406 acres. Deep, red, clayey Jory soils make up about 70 percent of the area, and moderately deep, red, clayey Nekia soils make up about 30 percent of the area. The Jory soils are mostly on rounded ridgetops and smooth sideslopes. The Nekia soils are mostly on the steeper uneven sideslopes. These soils are underlain by basalt. Mingled with the Nekia soils are minor inclusions of clayey-skeletal Ritner soils, and shallow, loamy-skeletal Witzel soils.
12-24/W	Jory silty clay loam - Ritner gravelly silty clay loam association, 10 to 35 percent slopes. 195 acres. Deep Jory soils make up about 70 percent of the area, and moderately deep, clayey-skeletal Ritner soils make up about 30 percent of the area. These soils are underlain by volcanic rocks. The Ritner soils are mostly on ridge crests and on slope breaks. Minor inclusions of Nekia soils are mingled with the Ritner soils on the steeper slopes.
12-24/WX	Jory silty clay loam - Ritner gravelly silty clay loam association, 10 to 65 percent slopes. 753 acres. Deep Jory soils make up about 70 percent of the area, and moderately deep, clayey-skeletal Ritner soils make up about 30 percent of the area. The Ritner soils are mostly on the steeper sideslopes and along slope breaks. These soils are underalin by volcanic rocks. About 70 percent of the area has slope gradients between 10 and 35 percent, and about 30 percent has gradients between 35 and 65 percent. Minor inclusions of nonskeletal Nekia soils are mingled with the Ritner soils on the steeper slopes.

12-24/X — Jory silty clay loam - Ritner gravelly silty clay loam association, 35 to 65 percent slopes. 89 acres. Deep Jory soils make up about 70 percent of the area and moderately deep, clayey-skeletal Ritner soils make up about 30 percent of the area. The Ritner soils make up about 30 percent of the area. The Ritner soils are mostly on the steeper sideslopes and along slope breaks. These soils are underlain by volcanic rocks. Minor inclusions of the nonskeletal Nekia soils are mingled with the Ritner soils on the steeper slopes.

12-50/W — Jory silty clay loam - Apt clay loam association, 10 to 35 percent slopes. 182 acres. Deep red Jory soils make up about 70 percent of the area and deep, brown Apt soils make up about 30 percent of the area. The Apt soils are mostly on slump benches. These soils are underlain by volcanic rocks. Minor inclusions of the moderately deep Nekia soils are mingled with the Jory soils. Mingled with the Apt soils are minor inclusions of Bateman and Renhaven soils.

12x-395/V — Jory silty clay loam - Renhaven loam association, 0 to 10 percent slopes. 2145 acres. Deep, red, clayey Jory soils make up about 70 percent of the area, and deep, fine-loamy Renhaven soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Jory soils are mostly on recent slump benches. Mingled with the Jory soils are minor inclusions of the light surface layered, clayey Bateman soils. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring soils.

12x-395/W — Jory silty clay loam - Renhaven loam association, 10 to 35 percent slopes, predominately southerly. 15,367 acres. Deep, red, clayey Jory soils make up about 70 percent of the area and deep, fine-loamy Renhaven soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Jory soils are mostly on old stable slump benches. The Renhaven soils are mostly on recent slump benches. Mingled with the Jory soils are minor inclusions of the light surface, clayey Bateman soils. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring soils.

12x-395/Wn — Jory silty clay loam - Renhaven loam association, 10 to 35 percent slopes, predominately northerly. 1363 acres. Deep, red, clayey Jory soils make up about 70 percent of the area, and deep, fine-loamy Renhaven soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Jory soils are mostly on old stable slump benches. The Renhaven soils are mostly on recent slump benches. Mingled with the Jory soils are minor inclusions of the light, surface layered, clayey Bateman soils. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring soils.

12x-396/WV — Jory silty clay loam - Bateman silt loam association, 0 to 35 percent slopes. 318 acres. Deep, dark surface Jory soils make up about 70 percent of the area, and deep, light surface Bateman soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Jory soils are mostly on old stable slump benches, ridgetops, and footslopes. The Bateman soils are mostly along drainage ways and on recent slump benches. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 0 and 10 percent. Mingled with the Jory soils are minor inclusions of the moderately deep Bellpine soils. Mingled with the Bateman soils are minor inclusions of the fine-loamy Renhaven soils, and the loamy-skeletal Atring soils on the steeper sideslopes and slump escarpments.

12x-396/W — Jory silty clay loam - Bateman silt loam association, 10 to 35 percent slopes. 1960 acres. Deep, dark surface Jory soils make up about 70 percent of the area, and deep, light surface layered Bateman soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Jory soils are mostly on old stable slump benches, ridgetops, and footslopes. The Bateman soils are mostly along drainage ways and on recent slump benches. Mingled with the Jory soils are minor inclusions of the moderately deep Bellpine soils. Mingled with the Bateman soils are minor inclusions of the fine-loamy Renhaven soils, and the loamy-skeletal Atring soils on the steeper sideslopes and slump escarpments.

12x-396/WX — Jory silty clay loam - Bateman silt loam association, 10 to 65 percent slopes. 594 acres. Deep, dark surface Jory soils make up about 70 percent of the area, and deep light surface Bateman soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Jory soils are mostly on old stable slump benches, ridgetops, and footslopes. The Bateman soils are mostly along drainage ways and on recent slump benches. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Jory soils are minor inclusions of the moderately deep Bellpine soils. Mingled with the Bateman soils are minor inclusions of the fine-loamy Renhaven soils, and the loamy-skeletal Atring soils on the steeper sideslopes and slump escarpments.

12x-396/XW — Jory silty clay loam - Bateman silt loam association, 10 to 65 percent slopes. 212 acres. Deep, dark surface Jory soils make up about 70 percent of the area, and deep, light surface Bateman soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Jory soils are mostly on old stable, slump benches, ridgetops, and footslopes. The Bateman soils are mostly along drainage ways and on recent slump benches. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Jory soils are minor inclusions of the moderately deep Bellpine soils. Mingled with the Bateman soils are minor inclusions of the fine-loamy Renhaven soils, and the loamy-skeletal Atring soils on the steeper sideslopes and slump escarpments.

12x-396/X — Jory silty clay loam - Bateman silt loam association, 35 to 65 percent slopes. 1347 acres. Deep, dark surface Jory soils make up about 70 percent of the area, and deep light surface Bateman soils make up about 30 percent of the area. These soils are underlain by sedimentary rocks. The Jory soils are mostly on old stable slump benches, ridgetops, and footslopes. The Bateman soils are mostly along drainage ways and on recent slump benches. Mingled with the Jory soils are minor inclusions of the moderately deep Bellpine soils. Mingled with the Bateman soils are minor inclusions of the fine-loamy Renhaven soils, and the loamy-skeletal Atring soils on the steeper sideslopes and slump escarpments.

BELLPINE SERIES (13)

The Bellpine series consists of moderately deep, well-drained, red, clayey soils formed from sedimentary colluvium in areas receiving from 30 to 50 inches of precipitation. They occur on foothills and ridges in the Coast Range at elevations of 400 to 2500 feet.

Profile Description: Bellpine silty clay loam

Surface Soil:	0-6"	Dark reddish brown silty clay loam, firable, medium acid, (5 to 9 inches thick).
Subsoil:	6-26"	Dark reddish brown clay, very firm, strongly acid, (8 to 15 inches thick).
Representative Profile:	NE¼, NE¼, Sec. 18, T. 24 S., R. 7 W., on road 24-7-18.0, 200 feet north of its intersection with road 24-7-17.2.	

Variations: Depth to bedrock ranges from 20 to 40 inches. Coarse fragments of weathered sedimentary rock ranges from few to 50 percent with an average of less than 35 percent between 10 and 40 inches in the profile. Moist surface colors are very dark brown or dark reddish brown, and dry surface colors range from brown to reddish brown. It is a silty clay loam to light clay loam. Moist subsoil colors are dark reddish brown to reddish brown and dry colors of reddish brown, red, or yellowish red. It is a silty clay or clay.

Setting: The Bellpine soils occur on smooth convex foothills and steep uplands in the Coast Range at elevations of 400 to 2500 feet. The soils developed in colluvium from sandstone and siltstone.

The summers are warm and dry and the winters are cool and moist, the mean annual precipitation is between 25 and 50 inches. The average annual air temperature is 52° to 54° F., and the frost-free period ranges from 165 to 210 days. The soils are dry between depths of 4 and 12 inches for more than 45 days during the summer period.

The native vegetation is Douglas-fir with intermingled oak, madrone, and incense cedar commonly associated with ocean spray, hazel or salal, Oregon grape as understory.

Bellpine soils are associated with deep, red, clayey dark surface layered Jory soils; deep, red, clayey, light surface layered Bateman soils; deep, fine-loamy Renhaven soils; and moderately deep, loamy-skeletal Atring soils.

Soil Behavior and Recommendations:

Bellpine soils support productive stands of Douglas-fir. The average site index is 135 for northerly aspects and is not available for southerly aspects. The stand density is usually normal for Douglas-fir.

Clearcutting is the recommended harvesting practice for Bellpine soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult now in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on low elevation, southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 2 years following planting. Units should be planted the first winter following logging, to help the trees become established before the unit is invaded with pioneering vegetation.

Bellpine soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Bellpine soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Bellpine soils have a high water holding capacity. The low amount of coarse fragments, the clay loam texture of the surface soil plus the clay texture of the upper part of the subsoil, and the high organic matter content all blend together to produce a water holding capacity that is between 4.5 and 5.5 inches. This amount of moisture is adequate for the survival of bare-root Douglas-fir in a clearcut. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading is not needed on Bellpine soils.

Burning slash does not produce a significant increase in erosion on Bellpine soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount

through runoff during the first rainy season after burning. Recommendations are to spot burn wherever possible.

Bellpine soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendations are to seed units in Bellpine soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10 year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Bellpine soils. The material below the soil is usually soft, highly weathered sandstone and siltstone. Cut bank stability is high on slopes less than 35 percent and moderate on slopes over 35 percent. The most common failures are small slumps filling the ditches and part of the subgrade. These types of failures usually force the ditch water to go across the road and be exhausted in unstable locations.

Bellpine soils commonly occur on gentle, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the back slopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Bellpine soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Bellpine soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Bellpine soils are moderately well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 10 inches of compacted subsoil is adequate. When deep cuts are made in Bellpine to create a pond, normally the bottom will be highly fractured sandstone or siltstone. In this situation, a sealer made from the subsoil is recommended.

Hand built fire trails have the least impact on the soil. If tractors must be used to construct fire trails, then build closely spaced water bars.

Mapping Units:

12-12x/W — Bellpine silty clay loam - Jory silty clay loam association, 10 to 35 percent slopes. 532 acres. Moderately deep Bellpine soils make up about 70 percent of the area, and deep Jory soils make up about 30 percent of the area. The Jory soils occur on the smooth rounded ridgetops and concave toe slopes, and the Bellpine soils are on the steeper convex ridge crests and side slopes and along slope breaks. Minor inclusions of the skeletal, Atring soils are mingled with the Bellpine soils. Minor inclusions of Bateman and Renhaven soils are mingled with the Jory soils.

13-394/X — Bellpine silty clay loam - Atring gravelly loam association, 35 to 65 percent slopes. 880 acres. Moderately deep clayey Bellpine soils make up about 70 percent of the area, and loamy-skeletal Atring soils make up about 30 percent of the area. The Bellpine soils are mostly on smooth ridgetops and sideslopes. The Atring soils are mostly on steeper dissected sideslopes. Mingled with the Bellpine soils are minor inclusions of the deep Jory soils. Mingled with the Atring soils are minor inclusions of the fine-loamy Renhaven soils.

13-396/W — Bellpine silty clay loam - Bateman silt loam association 10 to 35 percent slopes. 250 acres. Moderately deep Bellpine soils make up about 60 percent of the area, and deep, light surface Bateman soils make up about 40 percent of the area. The Bellpine soils are mostly on the steeper sideslopes. The Bateman soils are mostly on the broad, rounded ridgetops. Mingled with the Bellpine soils are minor inclusions of the fine-loamy Renhaven soils, and the loamy-skeletal Atring soils. Mingled with the Bateman soils are minor inclusions of the dark surface Jory soils.

13-396/XY — Bellpine silty clay loam - Bateman silt loam association 35 to 90 percent slopes. 418 acres. Moderately deep Bellpine soils make up about 60 percent of the area, and deep, light surface Bateman soils make up about 40 percent of the area. The Bellpine soils are mostly on the steeper sideslopes. The Bateman soils are mostly on the broad, rounded ridgetops. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Bellpine soils are minor inclusions of the fine-loamy Renhaven soils, and the loamy-skeletal Atring soils. Mingled with the Bateman soils are minor inclusions of the dark surface layered Jory soils.

HONEYGROVE SERIES (14)

The Honeygrove series consists of deep, red, well-drained, clayey soils formed in colluvium from basic igneous and sedimentary rocks, in areas receiving from 50 to 80 inches of precipitation. They are found on stable landscapes with nearly level to steep slopes in the Coast Range and Cascade Mountains at elevations of 500 to 2500 feet.

Profile Description: Honeygrove clay

Surface Soil:	0-12"	Dark reddish brown silty clay loam, friable, slightly acid, (4 to 14 inches thick).
Subsoil:	12-105"	Dark red clay, friable, strongly acid, (30 to 95 inches thick).
Substrata:	105"+	Variegated brown and yellow sandstone and shale fragments.

Representative Profile: SE¼, NE¼, Sec. 23, T. 21 S., R. 6 W., along road 21-6-13.0, ½ mile from its intersection with road 21-5-18.0.

Variations: This soil is typically over 5 feet thick, but may be as thin as 40 inches. The substratum may include such basic igneous rocks as basalt, gabbro or diorite and sedimentary sandstone and siltstone. Coarse fragments are normally few but may range up to 25 percent in the subsoil and up to 50 percent below 40 inches. Moist surface colors range from dark reddish-brown to very dark brown and dry colors range from reddish brown and yellowish red to brown. The texture may be a silty clay loam, clay loam or clay. Moist subsoil colors range from dark reddish brown to dark brown and dry colors range from reddish brown and yellowish red to brown. The texture may be a silty clay loam, clay loam or clay. Moist subsoil colors range from dark reddish brown to dark brown and dry colors range from reddish brown, yellowish red to brown. Subsoil texture is a silty clay or clay with the amount of clay ranging from 50 to 60 percent or more.

Setting: Honeygrove soils are on gently sloping broad ridgetops and sideslopes with gradients up to 50 percent in the Coast Range and Cascade Mountains at elevations of 500 to 2500 feet. The soils developed in very deep, fine-textured colluvium from volcanic and sedimentary rocks. The winters are cool and moist, and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for less than 45 days during the dry summer season. Mean annual precipitation ranges from 50 to 80 inches. Average annual temperagure is 45° to 53° F., average January temperature is about 39° F.; and average July temperature is about 64° F. The average frost-free period is 160 to 210 days. The native vegetation has a canopy of Douglas-fir with some hemlock and incense cedar, and an understory of vine maple, salal, sword fern, red huckleberry and ocean spray.

Honeygrove soils are associated with the moderately deep, clayey Peavine soils; the deep, brown, clayey Apt soils; the deep fine-loamy Preacher soils; the deep, red clay-skeletal Shivigny soils; the deep loamy-skeletal Klickitat soils; and the moderately deep, loamy-skeletal Harrington soils.

Soil Behavior and Recommendations (Honeygrove soils over sediments):

Honeygrove soils support productive stands of Douglas-fir with some hemlock, western red cedar and grand fir. The average site index is 175 for northerly aspects and 175 for southerly aspects. The stand density is usually normal for Douglas-fir. These soils are among the most productive in the District.

Clearcutting is the recommended harvesting practice for Honeygrove soils. These soils occur in moist environments where the growth of Douglas-fir is good. Aspect does not play a strong role in tree growth on Honeygrove soils. Competing vegetation is usually not a problem. Occasionally, a very dense stand of Ceanothus velutinus will get established after a hot burn. If the Douglas-fir does not get established the first two years after the burn, the ceanothus can be a strong competitor. Recommendations are to control the density of the ceanothus by spot burning or seeding and to get the Douglas-fir established the first year after harvesting.

For areas that have heavy stands of ceanothus with little or no Douglas-fir stocking, the recommendations are to use herbicides, mechanical scarification, and plant.

Honeygrove soils are high in clay content. They compact easily from tractor logging as shown in Figure 12. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Honeygrove soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Honeygrove soils have a high water holding capacity. The low amount of coarse fragments, the clay loam or clay texture of the surface soil plus the clay texture of the upper part of the subsoil, and high organic matter content all blend together to produce a water holding capacity that is between 4.5 and 5.5 inches. This amount of moisture is adequate for survival of bare-root Douglas-fir seedlings in a clearcut. The success of bare-root Douglas-fir seedlings is high. Shading is not needed on Honeygrove soils.

Figure 12. The compaction shown here occurred on a Honeygrove soil when the soil was at field capacity.

Burning slash does not produce a significant increase in erosion on Honeygrove soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendations are to spot burn wherever possible.

Honeygrove soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendations are to seed units in Honeygrove soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Honeygrove soils. The material below the soil is usually soft, highly weathered sandstone and siltstone. Cut bank stability is high on slopes less than 35 percent and low on slopes over 35 percent. The most common failures are slumps coming down from above the road.

Honeygrove soils commonly occur on gentle, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the back slopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Honeygrove soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Honeygrove soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Honeygrove soils are well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 12 inches of compacted subsoil is adequate.

Fire trails built by hand have the least impact on the soil. If tractors must be used, build closely spaced water bars.

Soil Behavior and Recommendations (Honeygrove soils over tuffs and breccias):

All the above statements for Honeygrove soils over sediments apply to Honeygrove soils over tuffs and breccias with the following exceptions:

1. The site index is lower. For both northerly and southerly aspects the site index is 126 making this soil a site III. Reasons why the site is lower are not completely known. Foliar analysis showed trees growing on Honeygrove developing from tuff had a signigicantly lower nitrogen content. This soil occurs at the higher elevations in the Little River area and along the North Umpqua River. The low soil temperature could play a part in explaining the low nitrogen content. Recommendations are to fertilize these stands with nitrogen as soon as the canopy is closed. These soils are prime candidates for the use of ceanothus.

2. Honeygrove soils over tuffs and breccias contain more expanding type clays. Sediment coming from disturbed areas tends to stay in suspension longer. Recommendation is to rock all new road construction.

3. When these soils are ripped following compaction from tractor logging, the compacted layers break up faster.

4. Extra road rock is needed on new fills made from these soils. Experience has shown that 16 to 24 inches of rock is needed to hold up log trucks.

Mapping Units:

14x-20x/V	Honeygrove silty clay loam - Peavine silty clay loam association, 0 to 10 percent slopes. 2830 acres. Deep Honeygrove soils make up about 60 percent of the area, and moderately deep Peavine soils make up about 40 percent of the area. The Honeygrove soils are mostly on broad smooth ridges underlain by sedimentary rocks, and the Peavine soils are mostly along slope breaks and on the steeper sideslopes. Minor inclusions of brown, clayey Apt soils are mingled with the Honeygrove soils and fine-loamy Preacher soils are mingled with Peavine soils.
14x-20x/W	Honeygrove silty clay loam - Peavine silty clay loam association, 10 to 35 percent slopes. 7095 acres. Deep Honeygrove soils make up about 60 percent of the area, and moderately deep Peavine soils make up about 40 percent of the area. The Honeygrove soils are mostly on broad smooth ridges underlain by sedimentary rocks, and the Peavine soils are mostly along slope breaks and on the steeper sideslopes. Minor inclusions of Apt soils are mingled with the Honeygrove soils, and fine-loamy Preacher soils are mingled with Peavine soils.

14t-20t/W — Honeygrove silty clay loam - Peavine silty clay loam association, 10 to 35 percent slopes. 6153 acres. Deep Honeygrove soils make up about 60 percent of the area, and moderately deep Peavine soils make up about 40 percent of the area. The Honeygrove soils are mostly on broad smooth ridgetops underlain by tuff, and the Peavine soils are mostly on the narrow ridge crests and the steeper sideslopes. Mingled with the Honeygrove soils are minor inclusions of weakly developed Blachly soils. Mingled with the Peavine soils are minor inclusions of loamy-skeletal Harrington and Klickitat soils.

14x-20x/WX — Honeygrove silty clay loam - Peavine silty clay loam association, 10 to 65 percent slopes. 1126 acres. Deep Honeygrove soils make up about 60 percent of the area, and moderately deep Peavine soils make up about 40 percent of the area. The Honeygrove soils are mostly on broad ridgetops and smooth sideslopes, underlain by sedimentary rocks, and the Peavine soils are mostly on narrow ridge crests and steeper sideslopes. About 70 percent of the area has slope gradients between 10 and 35 percent, and about 30 percent has gradients between 35 and 65 percent. Mingled with the Honeygrove soils are minor inclusions of Apt and Preacher soils. Mingled with the Peavine soils are minor inclusions of loamy-skeletal Digger soils.

14x-20x/X — Honeygrove silty clay loam - Peavine silty clay loam association, 35 to 65 percent slopes. 462 acres. Deep Honeygrove soils make up about 60 percent of the area, and moderately deep Peavine soils make up about 40 percent of the area. The Honeygrove soils are mostly on the rounded ridgetops and smooth sideslopes underlain by sedimentary rocks. The Peavine soils are mostly on the narrow ridge crests, ridge noses, and steeper sideslopes. Mingled with the Honeygrove soils are minor inclusions of Apt and Preacher soils. Mingled with the Peavine soils are minor inclusions of loamy-skeletal Digger soils.

14x-50/WX — Honeygrove silty clay loam - Apt clay loam association, 10 to 65 percent slopes. 647 acres. Deep red Honeygrove soils make up about 60 percent of the area, and deep brown Apt soils make up about 40 percent of the area. The Honeygrove soils are mostly on smooth ridgetops and sideslopes underlain by sedimentary rocks. The Apt soils are mostly on uneven lower slopes

and slump benches. About 70 percent of the area has slope gradients between 10 and 35 percent, and about 30 percent has gradients between 35 and 56 percent. Minor inclusions of Peavine soils are mingled with the Honeygrove soils. Minor inclusions of Preacher and Digger soils are mingled with the Apt soils.

14x-50/XW — Honeygrove silty clay loam - Apt clay loam association, 10 to 65 percent slopes. 643 acres. Deep red Honeygrove soils make up about 60 percent of the area, and deep brown Apt soils make up about 40 percent of the area. The Honeygrove soils are mostly on smooth ridgetops and sideslopes underlain by sedimentary rocks. The Apt soils are mostly on uneven lower slopes and slump benches. About 70 percent of the area has slope gradients between 35 and 65 percent. Minor inclusions of Peavine soils are mingled with the Honeygrove soils. Minor inclusions of Preacher and Digger soils are mingled with the Apt soils.

14x-50/X — Honeygrove silty clay loam - Apt clay loam association, 35 to 65 percent slopes. 712 acres. Deep red Honeygrove soils make up about 60 percent of the area, and deep brown Apt soils make up about 40 percent of the area. The Honeygrove soils are mostly on smooth ridgetops and sideslopes underlain by sedimentary rocks. The Apt soils are mostly on uneven lower slopes and slump benches. Minor inclusions of Peavine soils are mingled with the Honeygrove soils and Digger and Preacher soils are mingled with the Apt soils.

14x-57/W — Honeygrove silty clay loam - Preacher loam association, 10 to 35 percent slopes. 3087 acres. Deep red Honeygrove soils make up about 60 percent of the area, and deep brown Preacher soils make up about 40 percent of the area. The Honeygrove soils are mostly on the rounded stable ridgetops, and the Preacher soils are mostly on the steeper sideslopes. Minor inclusions of Peavine soils are mingled with the Honeygrove soils. Mingled with the Preacher soils are minor inclusions of loamy-skeletal Digger soils.

14x-57/X — Honeygrove silty clay loam - Preacher loam association, 35 to 65 percent slopes. 215 acres. Deep red Honeygrove soils make up about 60 percent of the area, and deep brown Preacher soils make up about 40 percent of the area. The Honeygrove soils are mostly on rounded stable ridgetops, and the Preacher soils are mostly on the steeper sideslopes and slump benches. Minor inclusions of Peavine soils are mingled with the Honeygrove soils. Inclusions of brown, clayey Apt and loamy-skeletal Digger soils are mingled with the Preacher soils.

14t-300/WV — Honeygrove silty clay loam - Shivigny very gravelly loam association, 0 to 35 percent slopes. 4946 acres. Deep, red clayey Honeygrove soils make up about 70 percent of the area, and deep, red, clayey-skeletal Shivigny soils make up about 30 percent of the area. These soils are underlain by tuffs and breccias. The Honeygrove soils are mostly on broad, rounded ridgetops and ridge noses. The Shivigny soils are mostly on the steeper sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 0 and 10 percent. Mingled with the Honeygrove soils are minor inclusions of moderately deep, clayey Peavine soils. Mingled with the Shivigny soils are minor inclusions of deep, loamy-skeletal Klickitat soils, and moderately deep, loamy-skeletal Harrington soils.

14t-300/W — Honeygrove silty clay loam - Shivigny very gravelly loam association, 10 to 35 percent slopes. 16,068 acres. Deep, red, clayey Honeygrove soils make up about 70 percent of the area, and deep, red, clayey-skeletal Shivigny soils make up about 30 percent of the area. These soils are underlain by tuffs and breccias. The Honeygrove soils are mostly on broad, rounded ridgetops and ridge noses. The Shivigny soils are mostly on the steeper sideslopes. Mingled with the Honeygrove soils are minor inclusions of moderately deep, clayey Peavine soils. Mingled with the Shivigny soils are minor inclusions of deep, loamy-skeletal Klickitat soils; and moderately deep, loamy-skeletal Harrington soils.

14t-300/WX — Honeygrove silty clay loam - Shivigny very gravelly loam association, 10 to 65 percent slopes. 2077 acres. Deep, red, clayey Honeygrove soils make up about 60 percent of the area, and deep, red clayey-skeletal Shivigny soils make up about 40 percent of the area. These soils are underlain by tuffs and breccias. The Honeygrove soils are mostly on broad, rounded ridgetops and ridge noses. The Shivigny soils are mostly on the steeper sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Honeygrove soils are minor inclusions of moderately deep, clayey Peavine soils. Mingled with the Shivigny soils are minor inclusions of deep, loamy-skeletal Klickitat soils, and moderately deep, loamy-skeletal Harrington soils.

14t-300/X	Honeygrove silty clay loam - Shivigny very gravelly loam association, 35 to 65 percent slopes. 4300 acres. Deep, red, clayey Honeygrove soils make up about 50 percent of the area, and deep, red, clayey-skeletal Shivigny soils make up about 50 percent of the area. These soils are underlain by tuffs and breccias. The Honeygrove soils are mostly on broad, rounded ridgetops and ridge noses. The Shivigny soils are mostly on the steeper sideslopes. Mingled with the Honeygrove soils are minor inclusions of moderately deep, clayey Peavine soils. Mingled with the Shivigny soils are minor inclusions of deep, loamy-skeletal Harrington soils.
14t-300-29/WX	Honeygrove silty clay loam - Shivigny very gravelly loam - Harrington very gravelly loam association, 10 to 65 percent slopes. 3004 acres. Deep, red, clayey Honeygrove soils make up about 50 percent of the area; deep, red, clayey-skeletal Shivigny soils make up about 30 percent of the area; and moderately-deep, loamy-skeletal Harrington soils make up about 20 percent of the area. These soils are underlain by tuff and breccia. The Honeygrove soils are mostly on broad, rounded ridgetops and ridge noses. The Shivigny and Harrington soils are mostly on the steeper sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with Honeygrove soils are minor inclusions of moderately deep, clayey Peavine soils. Mingled with the Shivigny and Harrington soils are minor inclusions of the deep, loamy-skeletal Klickitat soils.

CRUISER SERIES (19)

The Cruiser series consists of deep, red, fine-loamy soils formed in colluvium from volcanic rocks in areas receiving over 70 inches of precipitation. They occur on ridgetops and sideslopes in the frigid regime of the Cascade Mountains at elevations above 2800 feet on northerly slopes, and above 3200 feet on southerly slopes.

Profile Description:

Surface Soil:	0-7"	Dark reddish brown gravelly loam, friable, very strongly acid, (4 to 9 inches thick).
Subsoil:	7-45"	Reddish brown gravelly clay loam, friable, very strongly acid, (36 to 60 inches thick).
Representative Profile:	SE¼, NE¼, NE¼ Sec. 28, T. 24 S., R. 1 W., on road 29.1 just past Mellow Moon Springs.	

Variations: Depth to bedrock ranges from 40 to 60 or more inches. Rock fragments range from 10 to 30 percent in the surface soil, and from 20 to 35 percent in the subsoil. Reaction ranges from medium to very strongly acid. Texture of the surface soil is loam or clay loam. Color of the surface soil is dark reddish brown, dark brown, or dark grayish brown. Color of the subsoil is reddish brown or yellowish red. Texture of the subsoil is gravelly or cobbly loam or clay loam.

Setting: Cruiser soils are on broad sloping ridgetops and on sideslopes with gradients of 5 to 70 percent in the Cascade Mountains at elevations of 2800 to 4200 feet. The soils formed in medium textured colluvium weathered from basic volcanic rocks with some additions of volcanic ash in the surface. The soils have a humid temperate climate having a mean annual temperature of 41° to 45° F., mean July temperature of about 55° F., and a mean January temperature of about 31° F. The mean annual precipitation is 70 to 100 inches. The soils are dry between depths of 4 and 12 inches for less than 45 days during the summer. The frost-free period ranges from 90 to 130 days. The vegetation is dominated by western hemlock, Douglas-fir, and noble fir. The understory is a mixture of rhododendron, bear grass, sword fern, red huckleberry and blue huckleberry.

Cruiser soils are associated with soils of the moderately deep, loamy-skeletal Holderman; and the shallow, loamy-skeletal Winberry series in the frigid temperature regime. On adjacent lower elevations in the mesic zone are soils of the deep, red, clayey Blachly series; the dark colored loamy-skeletal Harrington and Klickitat series; and the light colored, loamy-skeletal Twindar and Zango series.

Soil Behavior and Recommendations:

Cruiser soils support productive stands of Douglas-fir with some hemlock, western red cedar and occasionally noble fir. The average site index is not available for northerly aspects and 115 for southerly aspects.

Road construction is generally easy. The soil is deep. Most of the excavation is done by blade. The material below the soil is usually soft, highly weathered, volcanic rocks. Cut bank stability is high on slopes less than 40 percent and low on slopes over 40 percent.

The most common failure is an occasional slump coming down from above the cut bank. The slumps are usually small.

The safest location for roads that are built through Cruiser soil is on slopes less than 40 percent away from rotational slumps.

Cruiser soils have the highest potential for failure when they are located at the toe of rotational slumps.

Sidecast from Cruiser soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Grass species that can tolerate short growing seasons and cold spring temperatures are recommended. Sediment that is produced when these soils are disturbed is silty and tends to settle slowly in runoff water. Recommendations are to seed, mulch and fertilize new road construction before the winter rains begin.

Rocking roads in Cruiser soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Fire trails built by hand have the least impact on the soil. When tractors are used for this purpose, closely spaced water bars are recommended.

Cruiser soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush) or Ceanothus sanguineus (redstem). These species fix nitrogen, provide browse for big game, and increase survival of Douglas-fir seedlings. Over a 10-year period these plants can produce 300 to 600 pounds of nitrogen per acre. It is recommended to seed units in Cruiser soils lightly with these species; a density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Burning slash does not produce a significant increase in erosion on Cruiser soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendations are to spot burn wherever possible.

The upper 20 inches of Cruiser soils have a high water holding capacity. The low amount of coarse fragments, the clay loam texture of the surface soil and the subsoil, and the high organic matter content all blend together to produce a water holding capacity that is between 4.0 and 5.0 inches. This amount of moisture is adequate for survival of Douglas-fir bare-root seedlings in clearcuts. The success of bare-root Douglas-fir seedlings is high.

Cruiser soils are moderately high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Cruiser soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

Clearcutting is the recommended harvesting practice for Cruiser soils. These soils occur in cool moist environments where the growth of Douglas-fir is good. Partial cutting on this soil would encourage the growth of hemlock, especially on north aspects. Competing vegetation is usually not a problem in reforesting these soils.

Getting these soils planted in the fall is difficult because of early deep snows. Recommendation is to consider spring planting. The success of spring planting will depend on a number of factors such as how early the snow leaves, how much soil moisture there is at the time of planting, and how hot the spring temperatures are.

Cruiser soils are moderately well suited for helipond locations. Deep cuts in this soil are usually in porous material. A sealer of 6 to 10 inches of compacted red clay is recommended for heliponds built in this soil. Cruiser soils are well suited for material to construct small earth dams.

Mapping Units:

19-400/WW	Cruiser gravelly loam - Holderman gravelly loam association, 10 to 35 percent slopes. 2404 acres. Deep, fine-loamy Cruiser soils make up about 70 percent of the area, and moderately deep, loamy-skeletal Holderman soils make up about 30 percent of the area. The Cruiser soils are mostly on broad, moderately steep ridgetops and smooth sideslopes. The Holderman soils are mostly on the steep sideslopes and narrow ridgetops. Mingled with the Holderman soils are minor inclusions of Winberry soils.

19-400/WX — Cruiser gravelly loam - Holderman gravelly loam association, 10 to 65 percent slopes. 2494 acres. Deep, fine-loamy Cruiser soils make up about 70 percent of the area, and moderately deep, loamy-skeletal Holderman soils make up about 30 percent of the area. The Cruiser soils are mostly on broad, moderately steep ridgetops and smooth sideslopes. The Holderman soils are mostly on the steep sideslopes and narrow ridgetops. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Holderman soils are minor inclusions of Winberry soils.

19-400/XY — Cruiser gravelly loam - Holderman gravelly loam association, 35 to 90 percent slopes. 862 acres. Deep, fine-loamy Cruiser soils make up about 60 percent of the area, and moderately deep, loamy-skeletal Holderman soils make up about 40 percent of the area. The cruiser soils are mostly on smooth sideslopes and broad ridgetops. The Holderman soils are mostly on very steep sideslopes and narrow ridgetops. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Holderman soils are minor inclusions of Winberry soils and rock land.

PEAVINE SERIES (20)

The Peavine series consists of moderately deep, well-drained, red clayey soils formed in colluvium from basic igneous and sedimentary rocks in areas with 50 to 90 inches of precipitation. These soils are predominantly found on slopes of less than 60 percent in the Coast Range at elevations of 600 to 2000 feet.

Profile Description: Peavine silty clay loams

Surface Soil:	0-10"	Dark brown silty clay loam, friable medium acid, (6 to 15 inches thick).
Subsoil:	10-36"	Yellowish red, silty clay, firm very strongly acid, (12 to 23 inches thick).
Substrata:	36-64"	Highly weathered sandstone.
Representative Profile:	NE¼, SW¼, Sec. 12, T. 21 S., R. 7 W., on Paradise Truck Trail.	

Variations: Depth to soft bedrock ranges from 20 to 40 inches. The substratum may include such basic igneous rocks as basalt, gabbro or diorite and sedimentary sandstone and siltstone. Coarse fragments are normally few but may range up to 25 percent in the subsoil. Moist surface colors range from dark reddish brown to very dark brown and dry colors range from reddish brown and yellowish red to brown. The texture may be a silty clay loam, clay loam or clay. Moist subsoil colors range from dark reddish brown to dark brown and dry colors range from reddish brown, yellowish red to brown. It is a silty clay or clay with the amount of clay ranging from 50 to 60 percent or more.

Setting: Peavine soils are on gently sloping broad ridgetops and sideslopes with gradients up to 50 percent in the Coast Range and Cascade Mountains at elevations of 600 to 2000 feet. The soils developed in very deep, fine-textured colluvium from volcanic and sedimentary rocks. The winters are cool and moist, and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for less than 45 days during the dry summer season. Mean annual precipitation ranges from 50 to 80 inches. Average annual temperature is 45° to 53° F., average January temperature is about 39° F., and average July temperature is about 64° F. The average frost-free period is 160 to 210 days. The native vegetation has a canopy of Douglas-fir with some hemlock and incense cedar, and an understory of vine maple, salal, sword fern, red huckleberry and ocean spray.

Peavine soils are associated with the deep, clayey Honeygrove soils; the deep, brown, clayey Apt soils, the deep fine-loamy Preacher soils; the deep, red, clayey-skeletal Shivigny soils; the deep loamy-skeletal Klickitat soils; and the moderately deep, loamy-skeletal Harrington soils.

Soil Behavior and Recommendations:

Peavine soils support productive stands of Douglas-fir with some hemlock, incense cedar and grand fir. The average site index is 175 for northerly aspects and 175 for southerly aspects. The stand density is usually normal for Douglas-fir.

Clearcutting is the recommended harvesting practice for Peavine soils. These soils occur in moist environments where the growth of Douglas-fir is good. Aspect does not play a strong role in tree growth on Peavine soils. Competing vegetation is usually not a problem. Occasionally a very dense stand of Ceanothus velutinus will get established after a hot burn. If the Douglas-fir does not get established the first two years after the burn, the ceanothus can be a strong competitor. Recommendations are to control the density of the ceanothus by spot burning or seeding and to get the Douglas-fir established the first year after harvesting.

For areas that have heavy stands of ceanothus with little or no Douglas-fir stocking, the recommendations are to use herbicides, mechanical scarification, and plant.

Peavine soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Peavine soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Honeygrove soils have a high water-holding capacity. The low amount of coarse fragments, the clay loam texture of the surface soil plus the clay texture of the upper part of the subsoil, and the high organic matter content all blend together to produce a water holding capacity that is between 4.5 and 5.5 inches. This amount of moisture is adequate for survival of bare-root Douglas-fir. The success of bare-root Douglas-fir seedlings is high. Shading is not needed on Peavine soils.

Burning slash does not produce a significant increase in erosion on Peavine soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendations are to spot burn wherever possible.

Peavine soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendations are to seed units in Peavine soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Peavine soils. The material below the soil is usually soft, highly weathered sandstone and siltstone. Cut bank stability is high on slopes less than 35 percent and moderate on slopes over 35 percent. The most common failures are slumps coming down from above the road. These slumps are frequently caused by taking away the support of the soil when it is on slopes over 35 percent.

Peavine soils commonly occur on gentle, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump, a procedure that reduces its support. If a road must be built through the toe of a rotational slump and the back slopes are less than 50 percent then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Peavine soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Peavine soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Peavine soils are well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 12 inches of compacted subsoil is adequate.

Fire trails built by hand have the least impact on the soil. If tractors must be used, build closely spaced water bars.

Soil Behavior and Recommendations (Peavine soils over tuffs and breccias):

All the above statements for Peavine soils over sediments apply to Peavine soils over tuffs and breccias with the following exceptions:

1. The site index is lower. For both northerly and southerly aspects the site index is 126, making this soil a site III. Reasons why the site is lower are not completely known. Foliar analysis showed trees growing in Peavine developing from tuff had a significantly lower nitrogen content. These soils occur at the higher elevations in the Little River area and along the North Umpqua River. The low soil temperature could play a part in explaining the low nitrogen content. Recommendations are to fertilize these stands with nitrogen as soon as the canopy is closed. These soils are prime candidates for the use of ceanothus.

2. Peavine soils over tuffs and breccias contain more expanding type clays. Sediment coming from disturbed areas tends to stay in suspension longer. Recommendation is to rock all new road construction.

3. When these soils are ripped following compaction from tractor logging, the compacted layers break up faster.

4. Extra road rock is needed on new fills made from these soils. Experience has shown that 16 to 24 inches of rock is needed to hold up log trucks.

Mapping Units:

20x-14x/X	Peavine silty clay loam - Honeygrove clay association, 35 to 65 percent slopes. 773 acres. Moderately deep Peavine soils make up about 70 percent of the area, and deep Honeygrove soils make up about 30 percent of the area. The Peavine soils are mostly along slope breaks, on ridge noses, and along narrow ridge crests. The Honeygrove soils are mostly on broad rounded ridgetops. Minor inclusions of Apt soils occur on the lower uneven toe slopes, and loamy-skeletal Digger soils occur on the steeper slopes at higher elevations.

NEKIA SERIES (23)

The Nekia series consists of moderately deep, red, clayey soils formed in fine textured colluvium from hard volcanic rocks in areas receiving from 35 to 60 inches of precipitation. They occur on rolling to steep foothills and ridges in the Cascades at elevations of 500 to 3200 feet.

Profile Description: Nekia clay loam

Surface Soil:	0-6"	Dark reddish brown, clay loam, friable, medium acid, (5 to 9 inches thick).
Subsoil:	6-26"	Dark red, clay, very firm, strongly acid, (12 to 35 inches thick).
Substratum:	26+"	Hard basalt.
Representative Profile:	NE¼, NE¼, Sec. 15, T. 22 S., R. 4 W., on the 20.0 road.	

Variations: Depth to hard rock ranges from 20 to 40 inches. Rock fragment content ranges from few to 50 percent in the lower part with an average of less than 35 percent. The color of the surface soils is dark reddish brown or very dark reddish brown. The texture of the surface soils is clay loam or silty clay loam. The color of the subsoil is dark red, red, dark reddish brown, or reddish brown. The texture of the subsoil is clay or silty clay. Clay films in the subsoil range from common, thin to many, moderately thick.

Setting: Nekia soils are on smooth convex foothills and ridges in the Cascade Mountains at elevations of 500 to 3200 feet. They developed in colluvium from basic volcanic rocks. The winters are cool and moist and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for more than 45 days during the summer period. The average annual temperature is 52° to 54° F., average January temperature is about 40° F., and the average July temperature is about 67° F. The annual precipitation is 35 to 60 inches. The frost-free period is 180 to 220 days. Native vegetation is dominated by Douglas-fir. The understory consists of poison oak, ocean spray, bracken fern, and grasses.

Associated with Nekia soils, are deep, red, clayey soils of the Jory series; shallow loamy-skeletal soils of the Witzel series; deep, dark brown, clayey soils of the Darby series; and moderately deep, clayey-skeletal soils of the Ritner series. Bellpine soils are similar to Nekia soils except that they have a paralithic contact with sedimentary rocks at depths of 20 to 40 inches.

Soil Behavior and Recommendations:

Nekia soils support productive stands of Douglas-fir with some incense cedar, madrone and grand fir. The average site index is 135 for northerly aspects and is not available for southerly aspects. The stand density is usually normal for Douglas-fir.

Clearcutting is the recommended harvesting practice for Nekia soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete for moisture. Controlling the competing vegetation is difficult because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on low elevation southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 2 years following planting. Units should be planted the first winter following logging. This helps get the trees established before the unit is invaded by pioneering vegetation.

Nekia soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Nekia soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Nekia soils have a high water holding capacity. The low amount of coarse fragments, the clay loam texture of the surface soil plus the clay texture of the upper part of the subsoil, and the high organic matter content all blend together to produce a water holding capacity that is between 4.5 and 5.5 inches. This amount of moisture is adequate for survival of bare-root Douglas-fir in a clearcut. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading is not needed on Nekia soils.

Burning slash does not produce a significant increase in erosion on Nekia soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendations are to spot burn wherever possible.

Nekia soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendations are to seed units in Nekia soils lightly with this species. A denisty of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Nekia soils. The material below the soil is usually soft, highly weathered basalt. Cut bank stability is high on slopes less than 35 percent and low on slopes over 35 percent. The most common failures are small slumps filling ditches and part of the subgrade. These types of failures usually force ditch water across the road, to be exhausted in unstable locations.

Nekia soils commonly occur on gentle, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the back slopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Nekia soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Nekia soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Nekia soils are moderately well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 10 inches of compacted subsoil is adequate. When deep cuts are made in Nekia to create a pond, normally the bottom will be highly weathered porous basalt. In this situation, a sealer made from the subsoil is recommended.

Hand built fire trails have the least impact on the soil. If tractors must be used to construct fire trails, then build closely spaced water bars.

Mapping Units:

23-12/VW — Nekia clay loam - Jory silty clay loam association, 0 to 35 percent slopes. 121 acres. Moderately deep, red Nekia soils make up about 60 percent of the area, and deep, red Jory soils make up about 40 percent of the area. The Nekia soils are mostly on ridgetops, ridge noses and along slope breaks. The Jory soils are mostly on broad rounded hills. These soils are underlain by basalt. About 70 percent of the slopes have gradients between 0 and 10 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Nekia soils are minor inclusions of the clayey-skeletal Ritner soils. Mingled with the Jory soils are minor inclusions of the dark brown, clayey Darby soils.

23-12/W — Nekia clay loam - Jory silty clay loam association, 10 to 35 percent slopes. 637 acres. Moderately deep, red Nekia soils make up about 60 percent of the area, and deep, red Jory soils make up about 40 percent of the area. The Nekia soils are mostly on ridgetops, ridge noses and along slope breaks. The Jory soils are mostly on broad rounded hills. These soils are underlain by basalt. Mingled with the Nekia soils are minor inclusions of the clayey-skeletal Ritner soils. Mingled with the Jory soils are minor inclusions of the dark brown, clayey Darby soils.

23-36/X — Nekia clay loam - Witzel very cobbly clay loam association, 35 to 65 percent slopes. 373 acres. Moderately deep, red, clayey Nekia soils make up about 60 percent of the area; and shallow, brown, loamy-skeletal Witzel soils make up about 40 percent of the area. The Nekia soils are mostly on north and east facing slopes, and the Witzel soils are mostly on south and west facing slopes. Mingled with the Nekia soils are minor inclusions of the deep, clayey Jory soils, and the loamy-skeletal Ritner soils. Mingled with Witzel soils are minor inclusions of rock land.

23-36/XY

Nekia clay loam - Witzel very cobbly clay loam association, 35 to 90 percent slopes. 209 acres. Moderately deep, red, clayey Nekia soils make up about 60 percent of the area, and shallow, brown, loamy-skeletal Witzel soils make up about 40 percent of the area. The Nekia soils are mostly on north and east facing slopes, and the Witzel soils are mostly on south and west facing slopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Nekia soils are minor inclusions of the deep, clayey Jory soils, and the loamy-skeletal Ritner soils. Mingled with Witzel soils are minor inclusions of rock land.

RITNER SERIES (24)

The Ritner soils are moderately deep, red, clayey-skeletal soils from volcanic rock colluvium in areas receiving from 35 to 50 inches of precipitation. They occur on steep to very steep slopes in the Cascade Mountains at elevations of 500 to 2000 feet.

Profile Description:

Surface Soil:	0-5"	Dark reddish brown, gravelly silty clay loam, friable, medium acid, (4 to 9 inches thick).
Subsoil:	5-39"	Dark reddish brown, very cobbly silty clay, firm strongly acid, (15 to 36 inches thick).
Substratum:	39+"	Fractured basalt bedrock.
Representative Provile:	SW¼, NE¼, Sec. 23, T. 25 S., R. 4 W., on 25-4-13.0 road about 3/4 mile south of junction of 25-4-14.0 road.	

Variations: Depth to hard bedrock ranges from 20 to 40 inches. Rock fragment content ranges from 35 to 75 percent. Color of the surface soil is dark reddish brown, reddish brown, or dark brown. The texture of the surface soil is gravelly clay loam or gravelly silty clay loam. The color of the subsoil is dark reddish brown, reddish brown, yellowish red or red. The texture is very cobbly or very gravelly clay or silty clay.

Setting: Ritner soils occur on hilly or steep foothills in the Cascade Mountains at elevations of 500 to 2000 feet. They formed in fine-textured very cobbly colluvium from basic volcanic rocks. The summers are warm and dry and the winters are cool and moist. The soils are dry between depths of 4 and 12 inches for more than 45 days during the dry summer season. The mean annual precipitation ranges from 35 to 50 inches. The mean annual temperature is about 54° F., the mean January temperature is 38° F., and the mean July temperature is about 68° F. The average frost-free season is from 165 to 210 days. The native vegetation is dominated by a canopy of Dogulas-fir, big leaf maple and Oregon white oak with an understory of poison oak, hazel, bracken fern, and ocean spray.

Ritner soils are associated with soils of the shallow, loamy-skeletal Witzel series; the moderately deep, clayey Nekia soils; the deep, dark brown, clayey Darby soils and rock land.

Soil Behavior and Recommendations:

Ritner soils support stands of Douglas-fir with incense cedar and ponderosa pine. Average site index is 110 for northerly aspects and is not available for southerly aspects.

The upper 20 inches of Ritner soils have a moderate to low water holding capacity. The high amount of coarse fragments, the clay or clay loam texture, and the low amount of organic matter blend together to produce a water holding capacity that is between 1.5 and 2.5 inches. This amount of moisture is adequate for survival of Douglas-fir bare-root seedlings on north aspects. Invasion of grasses and poison oak is a problem on north aspects. Clearcutting is recommended followed with herbicides for 1 to 3 years after planting.

On southerly aspects, invasion of grasses and poison oak is rapid and serious as pointed out in Figure 13. Herbicides for 1 to 3 years will be necessary. The moderate water holding capacity is not enough for adequate survival of Douglas-fir seedlings. They need shade. Partial cuts are not recommended because of grass invasion. Strip clearcuts, small clearcuts, or artificial shade is recommended.

Burning slash does not produce a significant increase in erosion on northerly aspects. Losses of inorganic potassium and phosphorous do not appear to be significant. There are substantial losses of nitrogen, organic phosphorous and sulfur through volatilization and runoff. Recommendation is to spot burn where possible.

Road construction requires both ripping and blasting. The material below the soil is usually basalt of the Umpqua Formation.

Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out when material is placed on slopes over 80 percent. Recommendation is to end haul. A pioneer road can be used.

Sidecast from Ritner soils on slopes less than 80 percent is normally stable. Sidecast responds well to seeding and mulching. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Rocking roads is necessary for winter hauling.

Most of the Ritner soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent these soils can safely be tractor logged provided the following precautions are used:

Figure 13. Ritner and Darby soils are very prone to invasion of poison oak and grasses once they are clearcut. The heavy stand of poison oak shown here has gotten established in 4 years.

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Ritner soils are poorly suited for helipond locations because they are porous below the subsoil and occur on steep slopes. They are moderately well suited for material to construct small dams because of high clay content and high stone content.

Mapping Units:

24-36-R/Y — Ritner gravelly silty clay loam - Witzel very cobbly silt loam - Rock land association, 65 to 90 percent slopes. 3063 acres. Moderately deep Ritner soils make up about 45 percent of the area; shallow Witzel soils make up about 30 percent of the area; and rock land makes up about 25 percent of the area. The Ritner soils are mostly in the drainage ways of dissected very steep sideslopes. The Witzel soils and rock land are mostly on sharp ridge crests, on interfluves of dissected sideslopes, and on headwalls and slump escarpments. Mingled with the Ritner soils are minor inclusions of the nonskeletal Nekia soils.

HARRINGTON SERIES (29)

The Harrington series consists of moderately deep, well drained, loamy-skeletal soils formed in colluvial materials derived from volcanic rocks in areas receiving from 55 to 90 inches of precipitation. They are found on moderately steep to very steep topography in the Cascade Mountains at elevations of 500 to 3200 feet.

Profile Description: Harrington very gravelly clay loam.

Surface Soil:	0-15"	Dark reddish brown, very gravelly clay loam, friable, strongly acid, (11 to 22 inches thick).
Subsoil:	29-39"	Dark brown, very gravelly loam, very friable, very strongly acid, 70 percent coarse fragments, (8 to 20 inches thick).
Representative Profile:	NE¼, SW¼, Sec. 9, T. 25 S., R. 2 W., on the 9.0 road, 400 yards northwest of junction with 16.1 road.	

Variations: Depth is between 20 and 40 inches. The amount of coarse fragments of pebble and cobble size ranges from 15 to 50 percent in the surface layers and from 35 to 70 percent in the subsoil. The surface layers have moist colors of very dark brown to dark reddish brown and dry colors of dark brown to reddish brown. Textures are clay loam or loam. The subsoil has moist colors of dark reddish brown or reddish brown and dry colors of reddish brown to brown. It is dominantly a clay loam but ranges from heavy loam or silty clay loam.

Setting: Harrington soils are on steep and very steep slopes in the Cascade Mountains at elevations of 500 to 3200 feet. They are forming in colluvium from andesite, tuffs and breccia. The winters are cool and moist and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for less than 45 days during the summer season. Mean annual precipitation is from 55 to 90 inches. Average annual temperature is about 53° F., average January temperature is about 40° F., and average July temperature is about 64° F. The average frost-free period is 160 to 210 days. The native vegetation is dominated by a canopy of Douglas-fir, hemlock and incense cedar with an understory of vine maple, salal, sword fern, and ocean spray.

Harrington soils are associated with soils of the deep, red, clayey, well developed Honeygrove series; the deep, red, clayey, weakly developed Blachly series; the deep, red, loamy-skeletal Klickitat series; the shallow loamy-skeletal Kilchis series; the moderately, deep, brown, loamy-skeletal Twindar series; and the shallow, brown, loamy-skeletal Zango series.

Soil Behavior and Recommendations:

Harrington soils support stands of Douglas-fir with some hemlock, and grand fir. Average site index is 119 for northerly aspects and is not available for southerly aspects.

The upper 20 inches of Harrington soils have a moderate to low water holding capacity. The high amount of coarse fragments, the clay loam to loam texture, and the moderate amount of organic matter blend together to produce a water holding capacity that is between 1.5 and 2.5 inches. This amount of moisture is adequate for survival of seedlings on north aspects in clearcuts.

The success of bare-root Douglas-fir is high on northerly aspects in recent clearcuts. On southerly aspects most areas have a moderate survival of Douglas-fir. Areas having a direct west aspect on slopes over 70 percent do have a low survival rate. Partial cutting or artificial shade is recommended for Harrington soils on steep southerly aspects.

Burning slash does not produce a significant increase in erosion on northerly aspects. Losses of inorganic potassium and phosphorous do not appear to be significant. There are substantial losses of nitrogen, organic phosphorous and sulfur through volatilization and runoff. Recommendation is to spot burn where possible.

Road construction requires mostly blasting and ripping. The material below the soil is usually hard volcanic rocks.

Cut bank stability is high on slopes less than 80 percent and low on slopes less than 80 percent. The most common failure is sidecast sluicing out when it is placed on slopes over 80 percent. Recommend end hauling.

Sidecast from Harrington soils on slopes less than 80 percent is normally stable. Sidecast responds well to seeding and mulching. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Rocking roads is necessary for winter hauling.

Harrington soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendations are to seed units in Harrington soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Most of the Harrington soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Harrington soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Mapping Units:

29-35/Y	Harrington very gravelly clay loam - Klichis stony loam association, 65 to 90 percent slopes, predominantly southerly. 5535 acres. Moderately deep, skeletal Harrington soils make up about 60 percent of the area; and shallow skeletal Kilchis soils make up about 40 percent of the area. The Harrington soils are mostly on sideslopes and sharp ridgetops. The Kilchis soils are mostly on very steep sideslopes. Minor inclusions of rock land are mingled with the Kilchis soils. Minor amounts of clayey Blachly, and deep loamy-skeletal Klickitat soils are mingled with the Harrington soils.
29-35/Yn	Harrington very gravelly clay loam - Kilchis stony loam association, 65 to 90 percent slopes, predominantly northerly. 1766 acres. Moderately deep, skeletal Harrington soils make up about 60 percent of the area; and shallow skeletal Kilchis soils make up about 40 percent of the area. The Harrington soils are mostly on sideslopes and sharp ridgetops. The Kilchis soils are mostly on very steep sideslopes. Minor inclusions of rock land are mingled with the Kilchis soils. Minor amounts of clayey Blachly and deep loamy-skeletal Klickitat soils are mingled with the Harrington soils.
29-35-R/XY	Harrington very gravelly clay loam - Kilchis stony loam - Rock land association, 35 to 90 percent slopes. 2811 acres. Moderately deep, loamy-skeletal Harrington soils make up about 45 percent of the area; shallow, loamy skeletal Kilchis soils make up

about 30 percent of the area, and rock land makes up about 25 percent of the area. The Harrington soils are mostly on steep sideslopes and narrow ridgetops. The Kilchis soils and rock land are mostly on sharp ridge crests, very steep headwalls, and slump escarpments. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Harrington soils are minor inclusions of the deep, loamy-skeletal Kilckitat soils; and the deep, red clayey Blachly soils. Mingled with the Kilchis soils are minor inclusions of the brown, loamy-skeletal Twindar and Zango soils.

29-35-R/Y

Harrington very gravelly clay loam - Kilchis stony loam - Rock land association, 65 to 90 percent slopes. 1720 acres. Moderately deep, loamy-skeletal Harrington soils make up about 45 percent of the area; shallow, loamy-skeletal Kilchis soils make up about 30 percent of the area, and rock land makes up about 25 percent of the area. The Harrington soils are mostly on steep sideslopes and narrow ridgetops. The Kilchis soils and rock land are mostly on sharp ridge crests, very steep headwalls and slump escarpments. Mingled with the Harrington soils are minor inclusions of the deep loamy-skeletal Kilckitat soils; and the deep, red, clayey Blachly soils. Mingled with the Kilchis soils are minor inclusions of the brown, loamy-skeletal Twindar and Zango soils.

29-R/Y

Harrington very gravelly clay loam - rock land association, 65 to 90 percent slopes. 2172 acres. Moderately deep, loamy-skeletal Harrington soils make up about 60 percent of the area; and rock land makes up about 40 percent of the area. The Harrington soils are mostly on steep sideslopes and narrow ridgetops. The Kilchis soils and rock land are mostly on sharp ridge crests, very steep headwalls, and slump escarpments. Mingled with the Harrington soils are minor inclusions of the deep, loamy-skeletal Klickitat soils; and the shallow, loamy-skeletal Kilchis soils. Mingled with the rock land are minor inclusions of the brown, loamy-skeletal Twindar and Zango soils.

KILCHIS SERIES (35)

The Kilchis series consists of shallow, somewhat excessively drained, stony soils formed in colluvial materials derived from volcanic rocks in areas receiving from 55 to 90 inches of precipitation. They are found on steep to very steep topography in the Cascade Mountains at elevations of 500 to 3200 feet.

Profile Description: Kilchis stony loam

Surface Soil:	0-5"	Dark reddish brown, stony loam, friable, strongly acid, (4 to 8 inches thick).
Subsoil:	5-12"	Dark reddish brown, very gravelly silt loam, friable, very strongly acid, 65 percent coarse fragments, (5 to 9 inches thick).
Substrata:	12-20"	Hard, slightly fractured andesite.

Representative Profile: NW¼, SE¼, Sec. 24, T. 24 S., R. 2 W., at old rock pit 3/4 mile up the 24.0 road.

Variations: Depth to bedrock ranges from 10 to 20 inches. The profile has more than 35 percent coarse fragments. The surface layer has moist colors of very dark brown, dark brown or dark reddish brown and dry colors of dark brown, brown or reddish brown. Its texture is a stony to very stony loam. The subsoil has moist colors ranging from very dark brown, dark brown to dark reddish brown and dry colors of dark brown to reddish brown. Its texture ranges from a very gravelly silt loam to a very gravelly silty clay loam.

Setting: Kilchis soils are on steep and very steep slopes in the Cascade Mountains at elevations of 500 to 3200 feet. They formed in colluvium from andesite, tuff and breccia. The winters are cool and moist and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for less than 45 days during the summer season. Mean annual precipitation is from 55 to 90 inches. Average annual temperature is about 53° F., average January temperature is about 40° F., and average July temperature is about 64° F. The average frost-free period is 160 to 210 days. The native vegetation is dominated by a canopy of Douglas-fir, hemlock and incense cedar with an understory of vine maple, salal, sword fern and ocean spray.

Kilchis soils are associated with soils of the deep, red, clayey weakly developed Blachly series; the deep, red, loamy-skeletal Klickitat series; the moderately deep, loamy-skeletal Harrington series; the moderately deep, brown, loamy-skeletal Twindar series; the shallow, brown, loamy-skeletal Zango series, and rock land.

Soil Behavior and Recommendations:

Kilchis soils support stands of Douglas-fir and some grand fir. Average site index is 103 for northerly aspects and 84 for southerly aspects.

The soil has a low water holding capacity. The high amount of coarse fragments, the silt loam texture, and the low amount of organic matter produces a water holding capacity that is between 1.0 and 2.0. This amount of moisture is adequate for survival of Douglas-fir on northerly aspects. On southerly aspects it is not.

Clearcutting is recommended for northerly aspects. Partial cutting or strip cutting is recommended for southerly aspects. Figure 14 shows a young stand on Kilchis soil. It is fully stocked according to the capabilities of the soil but is below normal stocking. It takes fewer trees per acre to fully stock this soil. Recommendation is to reduce the volume per acre figures for acres of this soil.

Most of the Kilchis soils occur on slopes too steep for tractor logging. Cable logging is recommended.

Kilchis soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Broadcast, hot, slash burning does cause erosion on Kilchis soils when they occur on slopes over 70 percent on southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder to get seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn these soils.

Burning slash does not produce a significant increase in erosion on northerly aspects. Recommendation is to spot burn where possible.

Road construction requires mostly blasting. The material below the soil is usually hard volcanic rocks.

Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out on slopes over 80 percent. End hauling is recommended.

Sidecast from Kilchis soil on slopes less than 80 percent is normally stable. Sidecast does not respond well to seeding and mulching. There are very few fines. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Figure 14. This young stand on Kilchis soil represents the natural capabilities of the soil. The soil is fully occupied even though there are large openings, but below "normal" stocking.

Mapping Units:

35-R/Y — Kilchis stony loam - Rock land association, 65 to 90 percent slopes. 2688 acres. Shallow, loamy-skeletal Kilchis soils make up about 60 percent of the area; and rock land makes up about 40 percent of the area. The Kilchis soils are mostly on narrow ridgetops and dissected very steep sideslopes. The rock land is mostly on sharp ridge crests and very steep headwalls and slump escarpments along deeply dissected streams. Mingled with the Kilchis soils are minor inclusions of the deeper Harrington and Klickitat soils. Mingled with the rock land are minor inclusions of rock outcrop and the brown loamy-skeletal Twindar and Zango soils.

WITZEL SERIES (36)

The Witzel series consists of shallow, well drained, stony soils developed in colluvium from basic igneous rock in areas receiving from 35 to 50 inches of precipitation. They occur on moderately steep to very steep mountainous topography in the Cascade Mountains at elevations of 600 to 2800 feet.

Profile Description: Witzel very cobbly silty clay loam.

Surface Soil:	0-4"	Dark brown, very cobbly clay loam, friable, medium acid, (2 to 6 inches thick).
Subsoil:	4-19"	Dark brown, very cobbly silty clay loam, firm, medium acid, (3 to 22 inches thick).
Representative Profile:	SE¼, NE¼, Sec. 27, T. 25 S., R. 4 W., at junction of the 25-4-26.1 and 25-4-13.0 roads.	

Variations: Depth to bedrock ranges from 12 to 20 inches. Coarse fragment content ranges from 35 to 70 percent. The surface layer has moist colors of very dark brown to reddish brown. It is a very cobbly silt loam, silty clay loam or clay loam texture. The subsoil has moist colors of dark brown to reddish brown and dry colors ranging from brown to reddish brown. It is a very cobbly silty clay loam or clay loam.

Setting: The Witzel soils predominantly occur on moderately steep to very steep south and west facing slopes at elevations between 600 and 2800 feet. Slopes range from moderately steep to over 90 percent.

The summers are warm and dry and the winters are cool and moist. The mean annual precipitation is 35 to 50 inches. The mean annual air temperature ranges from 49° to 54° F., and the frost-free period ranges from 165 to 210 days. Native vegetation is dominated by a canopy of Douglas-fir, Oregon white oak, and madrone, with an understory of poison oak, ocean spray, hazel and grasses.

The Witzel soils are associated with soils of the moderately deep, clayey-skeletal Ritner series; the moderately deep, clayey Nekia series; the deep, clayey Darby series; and rock land.

Soil Behavior and Recommendations:

Witzel soils support scattered stands of Douglas-fir with some incense cedar and oak. Average site index is 92 for northerly aspects and 84 for southerly aspects.

The soil has a low water holding capacity. The high amount of coarse fragments, the clay loam texture, and the moderate amount of organic matter produces a water holding capacity that is between 0.5 and 1.5. This amount of moisture is not adequate for survival of Douglas-fir bare-root seedlings in clearcuts. Both aspects experience a rapid invasion of grasses and poison oak. The length of time to reforest this soil is longer than 5 years. An example of a 10 year old clearcut on Witzel soil is shown in Figure 15.

These soils usually do not support normally stocked stands.

Recommendations are:

1. For steep southerly aspects with high coarse fragment content, remove them from the allowable cut base.

2. For northerly aspects and gentler southerly aspects with low coarse fragment content, use partial cutting or narrow strip cuts followed with herbicides for 1 to 3 years.

3. Identify the areas of these soils and reduce the volume per acre that normal yield tables say will be produced. Frequently these soils produce about 60 percent of normal production.

Most of the Witzel soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Witzel soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Broadcast, hot, slash burning does cause erosion on Witzel soils when they occur on 70 percent southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity and makes it more difficult for seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn these soils.

Figure 15. An old clearcut on Witzel and Ritner soils has been invaded with poison oak and grasses. Very few Douglas-fir are present.

Burning slash does not produce a significant increase in erosion on northerly aspects.

Road construction requires mostly blasting. The material below the soil is usually hard basalt. Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out when it is placed on sideslopes over 80 percent.

Sidecast from Witzel soil on slopes less than 80 percent is normally stable. Sidecast does not respond well to seeding and mulching. There are very few fines. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Mapping Units:

36-397-R/X	Witzel very cobbly clay loam - Darby silty clay loam - Rock land association, 35 to 65 percent slopes. 1962 acres. Shallow Witzel soils make up about 45 percent of the area; deep Darby soils make up about 30 percent; and rock land makes up about 25 percent of the area. The Witzel soils are mostly on narrow ridgetops and steep dissected sideslopes. The Darby soils are mostly on broad ridgetops, in saddles and in broad concave drainage ways. The rock land is mostly on sharp ridge crests and on headwalls on sideslopes adjacent to deeply incised streams. Mingled with the Witzel soils are minor inclusions of the clayey-skeletal Ritner soils. Mingled with the Darby soils are minor inclusions of the red, clayey Nekia and Jory soils.

APT SERIES (50)

The Apt series consists of deep, well drained, brown, clayey soils developed in sandstone colluvium in areas receiving from 50 to 90 inches of precipitation. These soils occur on gently sloping to steep slump benches and sideslopes in the Coast Range at elevations of 600 to 2000 feet.

Profile Description: Apt clay loam

Surface Soil:	0-8"	Very dark brown clay loam, friable, strongly acid, (2 to 4 inches thick).
Subsoil:	8-63"	Dark brown, brown, or yellowish brown clay, friable to firm, very strongly acid, (20 to 66 inches thick).
Substrata:	63"+	Weathered sedimentary bedrock
Representative Profile:	SW¼SE¼, Sec. 15, T. 21 S., R. 6 W., on south fork of Smith River Access Road about 250 yards east of intersection of 21-6-15.0 road.	

Variations: Depth to bedrock is greater than 40 inches. Coarse fragment content in the profile ranges from none to 25 percent. The surface layer has moist colors ranging between very dark brown, very dark grayish brown and dark brown and dry colors may be dark brown, dark grayish brown or brown. It is of clay loam or clay texture. The subsoil has moist colors ranging from dark brown to brown and dry colors of brown, dark yellowish brown or yellowish brown. It is clay to silty clay with 45 to 60 percent clay.

Setting: These soils occur on uneven or complex slopes in mountainous topography at elevations of 500 to 2000 feet in the Coast Range. Slopes are irregular with gradients ranging up to 50 percent. They have formed in fine textured, weathered sandstone colluvium.

The summers are warm and dry and the winters are cool and moist. The mean annual precipitation is between 50 and 90 inches. The mean annual temperature is 48° to 52° F., and the frost-free period is between 160 and 200 days. The native vegetation is dominated by a canopy of Douglas-fir, western red cedar, and big leaf maple with an understory of vine maple, salal, oxalis, and sword fern.

Apt soils are associated with soils of the deep, red, clayey Honeygrove series; the deep fine-loamy Preacher series; and the moderately deep, loamy-skeletal Digger series.

Soil Behavior and Recommendations:

Apt soils support productive stands of Douglas-fir with some western red cedar, and hemlock. The average site index is 175 for northerly aspects and 175 for southerly aspects. The stand density is usually normal for Douglas-fir. These soils are among the most productive in the District.

Clearcutting is the recommended harvesting practice for Apt soils. These soils occur in moist environments where the growth of Douglas-fir is good. Aspect does not play a strong role in tree growth on Apt soils. Competing vegetation is usually not a problem. Occasionally a very dense stand of Ceanothus velutinus will get established after a hot burn. If the Douglas-fir does not get established the first two years after the burn, the ceanothus can be a strong competitor. Recommendations are to control the density of the ceanothus by spot burning or seeding and to get the Douglas-fir established the first year after harvesting.

For areas that have heavy stands of ceanothus with little or no Douglas-fir stocking, the recommendations are to use herbicides, mechanical scarification and plant.

Apt soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Apt soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.
2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.
3. Tractors are not allowed to operate on slopes over 35 percent.
4. All major skid trails be water barred.

The upper 20 inches of Apt soils have a high water holding capacity. The low amount of coarse fragments, the clay loam or silty clay loam texture of the surface soil plus the clay texture of the upper part of the subsoil, and the high organic matter content all blend together to produce a water holding capacity that is between 4.5 and 5.5 inches. This amount of moisture is adequate for survival of bare-root Douglas-fir seedlings in a clearcut. The success of bare-root Douglas-fir seedlings is high. Shading is not needed on Apt soils.

Burning slash does not produce a significant increase in erosion on Apt soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendation is to spot burn wherever possible.

Apt soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendations are to seed units in Apt soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Apt soils. The material below the soil is usually soft, highly weathered sandstone and siltstone. Cut bank stability is moderate on slopes less than 35 percent and low on slopes over 35 percent. The most common failures are slumps gradually sliding into the road where rotational slumps have been cut. Occasionally fills made from Apt soil will slump.

Apt soils commonly occur on gentle, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the back slopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Apt soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Apt soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Apt soils are well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 10 inches of compacted subsoil is adequate.

Fire trails built by hand have the least impact on the soil. If tractors must be used, build closely spaced water bars.

Apt soils that are located east of Glide in Britt Creek and around Mt. Scott are developing from volcanic rocks. All the above comments apply except:

1. The site index is lower. Site index is 125 for both northerly and southerly aspects. Reasons why the site is lower are not completely known. Recommendations for this soil are to seed with ceanothus, let it grow 10 years, spray ceanothus, and fertilize young stands when their canopies close.

2. Cut banks tend to fail more. Recommend extra care in locating roads. Try to avoid all slumps. Where that is not possible, rip rap cut banks when cutting into toe of old slumps. Drain sag ponds that occur above and adjacent to roads.

3. Tractor logging causes compaction easier. Recommend using cable logging wherever possible.

Mapping Units:

50-29/W — Apt clay loam - Harrington very gravelly clay loam association, 10 to 35 percent slopes. 2739 acres. Deep Apt soils make up 70 percent of the area and moderately deep Harrington soils make up about 20 percent. The remaining soils are inclusions of an unnamed dark colored, poorly drained, clayey soil that slumps when cut for a road.

The Apt soils are on gentle topography such as broad ridgetops and large landslides. Harrington soils occur on the steep short slopes next to streams and on narrow ridgetops.

50-29/X — Apt clay loam - Harrington very gravelly clay loam association, 35 to 65 percent slopes. 477 acres. Deep Apt soils make up 50 percent of the area and moderately deep Harrington soils make up about 40 percent. The remaining soils are inclusions of an unnamed dark poorly drained clay soil that slumps when cut for a road.

The Apt soils are on gentle topography such as broad ridgetops and large landslides. Harrington soils occur on the steep short slopes next to streams and on narrow ridgetops.

TWINDAR SERIES (53)

The Twindar series consists of light colored, moderately-deep, loamy-skeletal soils formed in colluvium from volcanic rocks in areas receiving from 60 to 90 inches of precipitation. They occur on steep and very steep slopes in the Cascade Mountains at elevations of 500 to 3200 feet.

Profile Description: Twindar very gravelly loam

Surface Soil:	0-9"	Dark brown very gravelly loam, very friable, medium acid, (5 to 10 inches thick).
Subsoil:	9-25"	Yellowish brown very gravelly light clay loam, friable, (10 to 35 inches thick).
Representative Profile:	NW¼, SE¼, Sec. 13, T. 24 S., R. 2 W., on road 24-2-24.0 about ½ mile from road 24-2-13.0.	

Variations: Depth to bedrock is between 20 and 40 inches. Rock fragment content ranges from 50 to 80 percent. The color of the surface soil is dark brown, brown, or yellowish brown. The texture of the surface soil is very gravelly loam or very gravelly silt loam. The color of the subsoil is yellowish brown, dark yellowish brown, or brown. The texture of the subsoil is very gravelly loam, or very gravelly clay loam.

Setting: Twindar soils are on narrow ridgetops and steep to very steep sideslopes at elevations of 500 to 3200 feet. The soils are forming in gravelly colluvium from light colored andesite, tuffs, and breccias. The climate has cool, moist winters, and warm, dry summers with precipitation ranging from 60 to 90 inches. The soils are dry at depths of 4 to 12 inches for less than 45 days during the summer period. Average annual temperature is 45° to 53° F., average January temperature is about 37° F., and the average July temperature is about 63° F. The frost-free period is 160 to 200 days. The native vegetation is dominated by Douglas-fir, hemlock and western red cedar. The understory consists of salal, vine maple, red huckleberry, and sword fern.

Twindar soils are associated with the shallow, loamy-skeletal Zango soils; the dark surface layered, moderately deep, loamy-skeletal Harrington soils; the dark surface layered, deep, loamy-skeletal Klickitat soils; the dark surfaced, shallow loamy-skeletal Kilchis soils; the weakly developed deep, red, clayey Blachly; the strongly developed deep, red, clayey Honeygrove soils; and the deep, red, clayey-skeletal Shivigny soils.

Soil Behavior and Recommendations:

Twindar soils support stands of Douglas-fir with hemlock and western red cedar. Average site index is 119 for northerly aspects and 94 for southerly aspects.

The upper 20 inches of Twindar soils have a moderate to low water holding capacity. The high amount of coarse fragments, the loam texture, and the moderate amount of organic matter blend to produce a water holding capacity that is between 1.5 and 2.5 inches. This amount of moisture is adequate for survival of seedlings on north aspects in clearcuts.

The success of bare-root Douglas-fir is high on northerly aspects in recent clearcuts. On southerly aspects most areas have a moderate survival of Douglas-fir. Areas having a direct west aspect on slopes over 70 percent do have a low survival rate. Partial cutting or artificial shade is recommended for these areas.

Burning slash does not produce a significant increase in erosion on northerly aspects. Losses of inorganic potassium and phosphorous do not appear to be significant. There are substantial losses of nitrogen, organic phosphorous and sulfur through volatilization and runoff. Recommendation is to spot burn where possible.

Road construction requires mostly blasting and ripping. The material below the soil is usually hard volcanic rocks.

Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out when it is placed on slopes over 80 percent. End hauling is recommended.

Sidecast from Twindar soils on slopes less than 80 percent is normally stable. Sidecast responds well to seeding and mulching. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Rocking roads is necessary for winter hauling.

Twindar soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendations are to seed units in Twindar soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Most of the Twindar soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Twindar soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Soil Behavior and Recommendations (Twindar soils with gravelly overlay):

All the above statements apply except for the following:

Twindar gravelly overlay soils support stands of scattered Douglas-fir and chinquapin. Average site index is 119 for northerly aspects and 94 for southerly aspects. The scattered stands appear to fully occupy the site.

The upper 20 inches of this soil have a very low water holding capacity. The high amount of coarse fragments and the low amount of organic matter produce a water holding capacity that is less than 1 inch. This amount of moisture in the upper 20 inches is not adequate for survival of bare-root seedlings. However, below the gravelly surface the water holding capacity is higher. Recommendation is to scrape away the gravel layer by hand and plant in the silt loam subsoil (see Figure 16).

The success of bare-root Douglas-fir is low on all aspects in recent clearcuts.

Mapping Units:

53-70/Y	Twindar very gravelly loam - Zango very gravelly sandy loam association, 65 to 90 percent slopes. 5057 acres. Moderately deep Twindar soils make up about 60 percent of the area, and shallow Zango soils make up about 40 percent of the area. The Twindar soils are mostly on narrow ridgetops, in drainage ways of very steep dissected slopes, and on the lower parts of the sideslopes. The Zango soils are mostly on the convex interfluves of dissected sideslopes. Mingled with the Twindar soils are minor inclusions of soils of the Klickitat and Harrington series. Mingled with the Zango series are minor inclusions of rock land and soils of the Kilchis series.

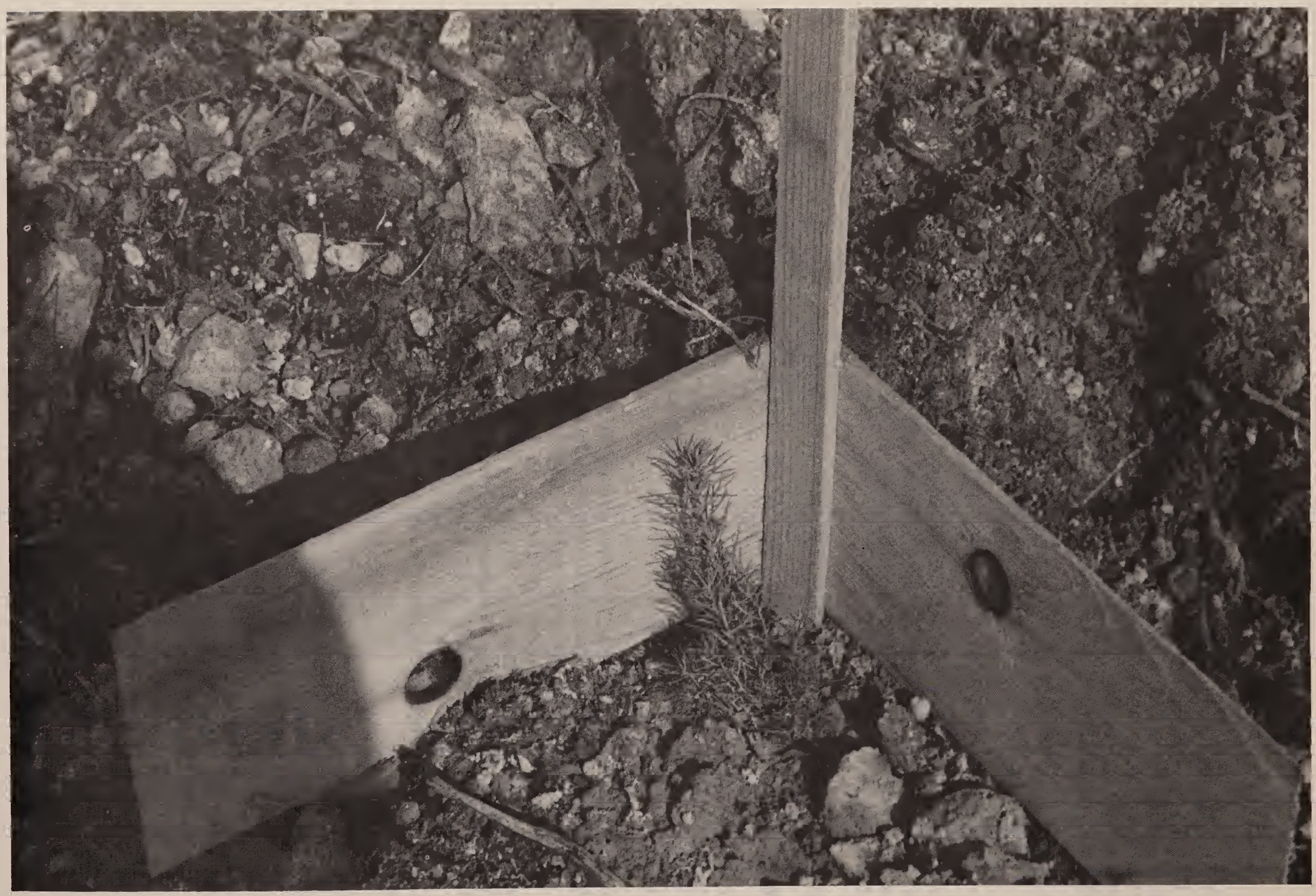


Figure 16. A scalped area of Twindar soil with a gravel overlay. Frequently, Twindar soils occur on very steep slopes. When the gravel is scalped away the material above the scalp ravels. To protect seedlings from raveling, shingles hinged together with nylon webbing are used. This allows the tree to be planted in a soil horizon with a higher moisture holding capacity.

PREACHER SERIES (57)

The Preacher series consists of deep, well drained, brown loamy soils developed in colluvial materials derived from arkosic sandstone in areas receiving from 50 to 90 inches of precipitation. They occur on gentle to steep slopes at elevations of 500 to 3000 feet in the Coast Range.

Profile Description: Preacher clay loam

Surface Soil:	0-14"	Very dark brown clay loam, friable, very strongly acid, (4 to 20 inches thick).
Subsoil:	14-42"	Dark yellowish brown clay loam, friable, very strongly acid, (20 to 32 inches thick).
Substrata:	42-70"+	Yellowish brown clay loam grading into weathered sandstone.
Representative Profile:	NW¼NW¼, Sec. 31, T. 15 S., R. 7 W., (view in roadcut of road number 15-7-17).	

Variations: Depth to bedrock ranges from 40 to 72 inches. Rock fragments, mostly small gravels, are commonly less than 20 percent in the solum. The surface layer has moist colors ranging from very dark brown and very dark grayish brown to dark brown and dry colors ranging from dark brown and dark yellowish brown to brown. It is clay loam or loam. Subsoil moist colors range from dark brown to dark yellowish brown and dry colors range from dark brown to yellowish brown. It is a clay loam with 27 to 35 percent clay.

Setting: Preacher soils occur on gently sloping convex ridges and smooth sideslopes. The general landscape often displays much evidence of old slump episodes. Elevations range from 500 to 3000 feet.

These soils are largely cool and moist, due to the marine climate, except for a comparatively short, warm, dry season during the summer. The mean annual precipitation is between 80 and 100 inches. The mean annual temperature is 49° F., and the average frost-free season is about 165 to 185 days.

The native vegetation is Douglas-fir and hemlock with vine maple, sword fern or salal; sword fern as the dominant understory plant community.

Preacher soils are associated with soils of the deep, red, clayey, well developed Honeygrove series; the deep, brown, clayey Apt series; the moderately deep, loamy-skeletal Digger series; and the shallow, loamy-skeletal Jason and Umpcoos series.

Soil Behavior and Recommendations:

Preacher soils support productive stands of Douglas-fir with some hemlock, western red cedar, and grand fir. The average site index is 160 for northerly aspects and is not available for southerly aspects. A typical stand and landscape for Preacher soils are shown in Figures 17 and 18.

Road construction is mostly done by ripping and a small amount of blasting. The material below the soil is usually weathered sandstone and siltstone. Cut bank stability is high on slopes less than 60 percent, medium on slopes between 60 and 75 percent, and low on slopes over 75 percent. Most Preacher soils occur on slopes less than 60 percent. The most common failure is sidecast placed on slopes over 75 percent in draws. Occasionally a pocket of Preacher soil is found on slopes over 75 percent. When a road is put through it, the cut bank slumps and the sidecast sluices out. Recommend care in road layout and end haul segments over 75 percent in draws and 80 percent on sideslopes.

The safest location for roads that are built through Preacher soil is on slopes with gradients less than 60 percent.

Sidecast from Preacher soils on slopes less than 60 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Sediment that is produces when these soils are disturbed is silty and tends to settle slowly in runoff water. Recommendations are to seed, mulch, and fertilize new road construction before the winter rains begin.

Rocking roads in Preacher soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Fire trails built by hand have the least impact on the soil. When tractors are used for this purpose, closely spaced water bars are recommended.

Preacher soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. It is recommended to seed Preacher soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Burning slash does not produce a significant increase in erosion on Preacher soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendations are to spot burn wherever possible.

Figure 18. A typical landscape of Preacher and Digger soils. Both soils support normally stocked stands.

Figure 17. A vigorous stand on Preacher soil that has been commercially thinned.

The upper 20 inches of Preacher soils have a high water holding capacity. The low amount of coarse fragments, the loam or clay loam texture of the surface soil plus the clay loam texture of the upper part of the subsoil, and the moderate amount of organic matter all blend to produce a water holding capacity that is between 4.0 and 4.5 inches. This amount of moisture is adequate for survival of Douglas-fir, bare-root seedlings in clearcuts. The survival success of bare-root Douglas-fir seedlings is high on northerly aspects. Shading is not needed on Preacher soils.

Most of the Preacher soils occur on slopes too steep for tractor logging. Cable logging is the recommended practice. Occasionally areas of this soil are on slopes gentle enough to use tractors for yarding. Preacher soils have a medium clay content and are not as easily compacted as the red clay soils. On areas that have slopes less than 35 percent, Preacher soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. All major skid trails be water barred.

Clearcutting is the recommended harvesting practice for Preacher soils. Competition from grass and other species is not a problem on Preacher soils.

Preacher soils are moderately well suited for helipond locations. Deep cuts made in this soil can get into porous material. A sealer of 6 to 10 inches of compacted red clay is recommended.

The subsoil of Preacher soils is well suited for material to construct small earth dams. The particle size distribution is favorable for compaction.

Mapping Units:

57-14x/XW — Preacher clay loam - Honeygrove silty clay loam association, 10 to 65 percent slopes. 418 acres. Preacher soils make up about 60 percent of the area, and Honeygrove soils make up about 40 percent of the area. The Preacher soils are mostly on the ridges and smooth sideslopes and on narrow ridgetops. The Honeygrove soils are mostly on gently sloping convex, stable, ridgetops. About 70 percent of the area has slope gradients between 35 and 65 percent, and about 30 percent has gradients between 10 and 35 percent. Minor inclusions of loamy-skeletal Digger soils are mingled with the Preacher soils on the steeper slopes, and minor inclusions of Peavine and Apt soils are mingled with the Honeygrove soils.

57-14x/X — Preacher clay loam - Honeygrove silty clay loam association, 35 to 65 percent slopes. 1480 acres. Deep loamy Preacher soils make up about 60 percent of the area, and deep clayey Honeygrove soils make up about 40 percent of the area. The Preacher soils are mostly on the sideslopes and narrow ridgetops. The Honeygrove soils are mostly on broad, gently sloping convex, stable ridgetops and benches. Mingled with the Preacher soils are minor inclusions of loamy-skeletal Digger soils. Mingled with the Honeygrove soils are minor amounts of Apt and Peavine soils.

57-14x/XY — Preacher clay loam - Honeygrove silty clay loam association, 35 to 90 percent slopes, 332 acres. Preacher soils make up about 60 percent of the area, and Honeygrove soils make up about 40 percent of the area. The Preacher soils are mostly on the ridges and smooth sideslopes and on narrow ridgetops. The Honeygrove soils are mostly on gently sloping convex, stable ridgetops. About 70 percent of the area has slope gradients between 35 and 65 percent, and about 30 percent has gradients between 65 and 90 percent. Minor inclusions of Digger soils are mingled with the Preacher soils on the steeper slopes, and minor inclusions of Peavine and Apt soils are mingled with the Honeygrove soils.

57-14x-66/WX — Preacher clay loam - Honeygrove silty clay loam - Digger gravelly loam association, 10 to 65 percent slopes. 1248 acres. Deep loamy Preacher soils make up about 45 percent of the area; deep clayey Honeygrove soils make up about 35 percent of the area; and moderately deep, skeletal Digger soils make up about 20 percent of the area. The Preacher soils are mostly on the moderately steep sideslopes and narrow ridgetops. The Honeygrove soils are mostly on broad stable ridgetops. The Digger soils are mostly on the steep dissected sideslopes and the slump escarpments. About 70 percent of the slopes have gradients between 10 and 35 percent and about 30 percent have gradients between 35 and 65 percent. Mingled with the Preacher soils are minor inclusions of Apt soils. Mingled with the Honeygrove soils are minor inclusions of Peavine soils. Mingled with the Digger soils are minor inclusions of Jason and Umpcoos soils.

57-14x-66/X — Preacher clay loam - Honeygrove silty clay loam - Digger gravelly loam association. 35 to 65 percent slopes. 1084 acres. Deep loamy Preacher soils make up about 45 percent of the area; deep clayey Honeygrove soils make up about 35 percent of the area; and moderately deep skeletal Digger soils make up about 20 percent of the area. The Preacher soils are mostly on the moderately steep sideslopes and narrow ridgetops. The Honeygrove soils are mostly on broad stable ridgetops. The Digger soils are mostly on the steep dissected sideslopes and the slump escarpments. Mingled with the Preacher soils are minor inclusions of Apt soils. Mingled with the Honeygrove soils are minor inclusions of Peavine soils. Mingled with the Digger soils are minor inclusions of Jason and Umpcoos soils.

57-50/XW — Preacher clay loam - Apt clay loam association, 10 to 65 percent slopes. 380 acres. Deep loamy Preacher soils make up about 60 percent of the area and deep brown clayey Apt soils make up about 40 percent of the area. The Preacher soils are mostly on even, upper convex sideslopes. The Apt soils are mostly on the lower uneven convex and upper concave sideslopes and slump benches. Seventy percent of the slopes are between 35 and 65 percent. Minor inclusions of Digger soils are mingled with the Preacher soils and Honeygrove soils with the Apt soils.

57-50/X — Preacher clay loam - Apt clay loam association, 35 to 65 percent slopes. 2377 acres. Deep loamy Preacher soils make up about 60 percent of the area; and deep brown clayey Apt soils make up about 40 percent of the area. The Preacher soils are mostly on even, upper convex sideslopes. The Apt soils are mostly on the lower uneven convex and upper concave sideslopes and slump benches. Minor inclusions of Digger soils are mingled with the Preacher soils and Honeygrove soils with the Apt soils.

57-50-14x/XY — Preacher clay loam - Apt clay loam - Honeygrove silty clay loam association, 35 to 90 percent slopes. 629 acres. Deep, loamy Preacher soils make up about 50 percent of the area; deep, brown, clayey Apt soils make up about 30 percent of the area; and deep, red, clayey Honeygrove soils make up about 20 percent of the area. The Preacher soils are mostly on even, upper convex sideslopes. The Apt soils are mostly

on the lower uneven convex and upper concave sideslopes and slump benches. The Honeygrove soils are mostly on smooth stable ridgetops. About 70 percent of slopes have gradients between 35 and 65 percent. Minor inclusions of Digger soils are mingled with the Preacher soils; and of Peavine soils with the Honeygrove soils.

57-66/X — Preacher clay loam - Digger gravelly loam association, 35 to 65 percent slopes. 2177 acres. Deep, loamy Preacher soils make up about 70 percent of the area; and skeletal Digger soils make up about 30 percent of the area. The Preacher soils are mostly on smooth sideslopes and narrow ridgetops. The Digger soils are mostly on the steeper sideslopes. Minor inclusions of Apt and Honeygrove soils are mingled with the Preacher soils. Minor amounts of Jason and Umpcoos soils are mingled with the Digger soils.

57-66/XY — Preacher clay loam - Digger gravelly loam association, 35 to 90 percent slopes. 5665 acres. Deep, loamy Preacher soils make up about 70 percent of the area; and skeletal Digger soils make up about 30 percent of the area. The Preacher soils are mostly on smooth sideslopes and narrow ridgetops. The Digger soils are mostly on the steeper sideslopes. About 70 percent of the slopes have gradients between 35 and 65 percent. Minor inclusions of Honeygrove soils are mingled with the Preacher soils. Minor amounts of Jason and Umpcoos soils are mingled with the Digger soils.

57-66-14x/X — Preacher clay loam - Digger gravelly loam - Honeygrove silty clay loam association, 35 to 65 percent slopes. 767 acres. Deep, loamy Preacher soils make up about 45 percent of the area; moderately deep, loamy-skeletal Digger soils make up about 35 percent of the area; and deep, clayey Honeygrove soils make up about 20 percent of the area. The Preacher soils are mostly on the moderately steep sideslopes and narrow ridgetops. The Honeygrove soils are mostly on broad stable ridgetops. The Digger soils are mostly on the steep dissected sideslopes and the slump escarpments. Mingled with the Preacher soils are minor inclusions of Apt soils. Mingled with the Honeygrove soils are minor inclusions of Peavine soils. Mingled with the Digger soils are minor inclusions of Jason and Umpcoos soils.

57-66-50/X Preacher clay loam - Digger gravelly loam - Apt clay loam association, 35 to 65 percent slopes. 2173 acres. Deep, fine-loamy Preacher soils make up about 40 percent of the area; skeletal Digger soils make up about 35 percent of the area; and deep, clayey Apt soils make up about 25 percent of the area. The Preacher soils are mostly on smooth sideslopes and narrow ridgetops. The Digger soils are mostly on the steeper sideslopes. The Apt soils are mostly on slump benches. Minor inclusions of Honeygrove soils are mingled with the Preacher and Apt soils. Minor amounts of Jason and Umpcoos soils are mingled with the Digger soils.

57-66-50/XY Preacher clay loam - Digger gravelly loam - Apt clay loam association, 35 to 90 percent slopes. 2213 acres. Deep, fine-loamy Preacher soils make up about 40 percent of the area; skeletal Digger soils make up about 35 percent of the area; and moderately deep, clayey Apt soils make up about 25 percent of the area. The Preacher soils are mostly on smooth sideslopes and narrow ridgetops. The Digger soils are mostly on the steeper sideslopes. The Apt soils are mostly on slump benches. About 70 percent of the area has slope gradients between 35 and 65 percent, and about 30 percent has gradients between 65 and 90 percent. Minor inclusions of Honeygrove soils are mingled with the Preacher and Apt soils. Minor amounts of Jason and Umpcoos soils are mingled with the Digger soils.

57-66-50/YX Preacher clay loam - Digger gravelly loam - Apt clay loam association, 35 to 90 percent slopes. 319 acres. Deep, fine-loamy Preacher soils make up about 40 percent of the area; skeletal Digger soils make up about 35 percent of the area; and moderately deep clayey Apt soils make up about 25 percent of the area. The Preacher soils are mostly on smooth sideslopes and narrow ridgetops. The Digger soils are mostly on the steeper sideslopes. The Apt soils are mostly on slump benches. About 70 percent of the area has slope gradients between 65 and 90 percent, and about 30 percent has gradients between 35 and 65 percent. Minor inclusions of Honeygrove soils are mingled with the Preacher and Apt soils. Minor amounts of Jason and Umpcoos soils are mingled with the Digger soils.

57-66-64/X — Preacher clay loam - Digger gravelly loam - Jason very gravelly loam association, 35 to 65 percent slopes. 463 acres. Deep, fine-loamy Preacher soils make up about 50 percent of the area; moderately deep, loamy-skeletal Digger soils make up about 30 percent of the area; and shallow, loamy-skeletal Jason soils make up about 20 percent of the area. The Preacher soils are mostly on narrow ridgetops, slump benches, and smooth sideslopes. The Digger soils are mostly on very steep dissected sideslopes. The Jason soils are mostly on slump escarpments and headwalls of deeply incised streams. Mingled with the Preacher soils are minor inclusions of Honeygrove and Apt soils. Mingled with the Digger and Jason soils are minor inclusions of Umpcoos soils and rock land.

57-66-64/XY — Preacher clay loam - Digger gravelly loam - Jason very gravelly loam association, 35 to 90 percent slopes. 826 acres. Deep, fine-loamy Preacher soils make up about 50 percent of the area; moderately deep, loamy-skeletal Digger soils make up about 30 percent of the area; and shallow, loamy-skeletal Jason soils make up about 20 percent of the area. The Preacher soils are mostly on narrow ridgetops, slump benches, and smooth sideslopes. The Digger soils are mostly on very steep dissected sideslopes. The Jason soils are mostly on slump escarpments and headwalls of deeply incised streams. About 70 percent of the slopes have gradients between 35 and 65 percent and about 30 percent have gradients between 65 and 90 percent. Mingled with the Preacher soils are minor inclusions of Honeygrove and Apt soils. Mingled with the Digger and Jason soils are minor inclusions of Umpcoos soils and rock land.

JASON SERIES (64)

The Jason series consists of shallow, loamy-skeletal soils from sandstone colluvium in areas receiving from 50 to 100 inches of precipitation. They occur on steep and very steep slopes in the Coast Range at elevations of 800 to 2800 feet.

Profile Description: Jason very gravelly loam

Surface Soil:	0-4"	Dark grayish brown, very gravelly loam, very friable, slightly acid, (3 to 8 inches thick).
Subsoil:	4-16"	Brown very gravelly loam, friable, slightly acid, (6 to 16 inches thick).
Substrata:	16"+	Soft, highly weathered sandstone.
Representative Profile:	NW¼, NE¼, Sec. 33, T. 24 S., R. 8 W., on road 33-24-27.3, 3/4 mile southwest of its junction with road 33-27-26.4.	

Variations: Depth to soft bedrock ranges from 10 to 20 inches. Rock fragment content ranges from 35 to 75 percent. Color of the surface layer is dark grayish brown, dark brown, or brown. Texture of the surface layer is very gravelly loam or very gravelly silt loam. Color of the subsoil is brown, dark yellowish brown, or yellowish brown. Texture of the subsoil is very gravelly loam or very gravelly silt loam.

Setting: Jason soils are on steep and very steep slopes in the Coast Range at elevations of 800 to 2800 feet. They formed from sandstone and siltstone colluvium. The winters are cool and moist and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for less than 45 days during the dry summers. Mean annual temperature is 51° F., average January temperature is about 39° F., and average July temperature is about 63° F. The average frost-free period is 160 to 190 days. The average precipitation is 50 to 100 inches. Native vegetation is dominated by a canopy of Douglas-fir and big leaf maple, with an understory of salal, sword fern, vine maple and ocean spray.

Jason soils are associated with soils of the shallow Umpcoos series with a lithic contact; the moderately deep, Digger series; and the deep, fine-loamy Preacher series.

Soil Behavior and Recommendations:

Jason soils support stands of Douglas-fir and some incense cedar. Average site index is 110 for northerly aspects and is not available for southerly aspects.

The soil has a low water holding capacity. The high amount of coarse fragments, the silt loam texture, and the moderate amount of organic matter produce a water holding capacity that is between 1.0 and 2.0. Clearcutting is recommended for northerly aspects.

On southerly aspects this amount of moisture is not adequate for survival of bare-root Douglas-fir. Partial or strip cutting is recommended.

These soils frequently have fewer trees growing on them than normal. The soil does not have the water holding capacity to support normal stocking. Recommendations are to identify the number of acres of these soils and reduce the volume per acre that normal yield tables say will be produced.

Most of the Jason soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Jason soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Broadcast, hot, slash burning does cause erosion on Jason soils when they occur on 70 percent southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder to get seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn these soils.

Burning slash does not produce a significant increase in erosion on northerly aspects. Recommendation is to spot burn where possible.

Road construction requires ripping and blasting. The material below the soil is usually moderately hard sandstone.

Cut bank stability is high on slopes less than 75 percent and low on slopes over 75 percent. The most common failure is sidecast sluicing out.

Road construction can cause severe erosion on Jason soils when they are on sideslopes over 80 percent or in draws with slopes over 75 percent as is evident in Figure 19. When sidecast becomes saturated it overloads the soil below it and triggers large debris avalanches. Recommendations are:

1. Avoid building roads in these soils.

2. If roads must be built, then roll the grade, keep them narrow, and end haul. Local experience has shown that these practices substantially reduced debris avalanches. Particular attention needs to be given to the way the pioneer road is constructed. In very steep segments, no pioneer is recommended. In other areas where a pioneer road can be used, a small cat with a U-shaped blade is recommended. Figure 32 shows a berm that is helpful to prevent sidecast from being lost over the side.

Selection of disposal sites requires as much care as does the location and construction of the road.

Sidecast from Jason soil on slopes less than 70 percent is normally stable. Sidecast does not respond well to seeding and mulching. There are very few fines. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Mapping Units:

64-66/XY — Jason very gravelly loam - Digger gravelly loam association, 35 to 90 percent slopes. 516 acres. Shallow Jason soils make up about 60 percent of the area; and moderately deep, Digger soils make up about 40 percent of the area. The Jason soils are mostly on very steep headwalls, sideslopes, and sharp ridge crests. The Digger soils are mostly on steep sideslopes, and on narrow ridgetops. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Jason soils are minor inclusions of Umpcoos soils and rock land. Mingled with the Digger soils are minor inclusions of Preacher soils.

64-66/YX — Jason very gravelly loam - Digger gravelly loam association, 35 to 90 percent slopes. 953 acres. Shallow Jason soils make up about 60 percent of the area; and moderately deep, Digger soils make up about 40 percent of the area. The Jason soils are mostly on very steep headwalls, sideslopes, and sharp ridge crests. The Digger soils are mostly on steep sideslopes and on narrow ridgetops. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Jason soils are minor inclusions of Umpcoos soils and rock land. Mingled with the Digger soils are minor inclusions of Preacher soils.

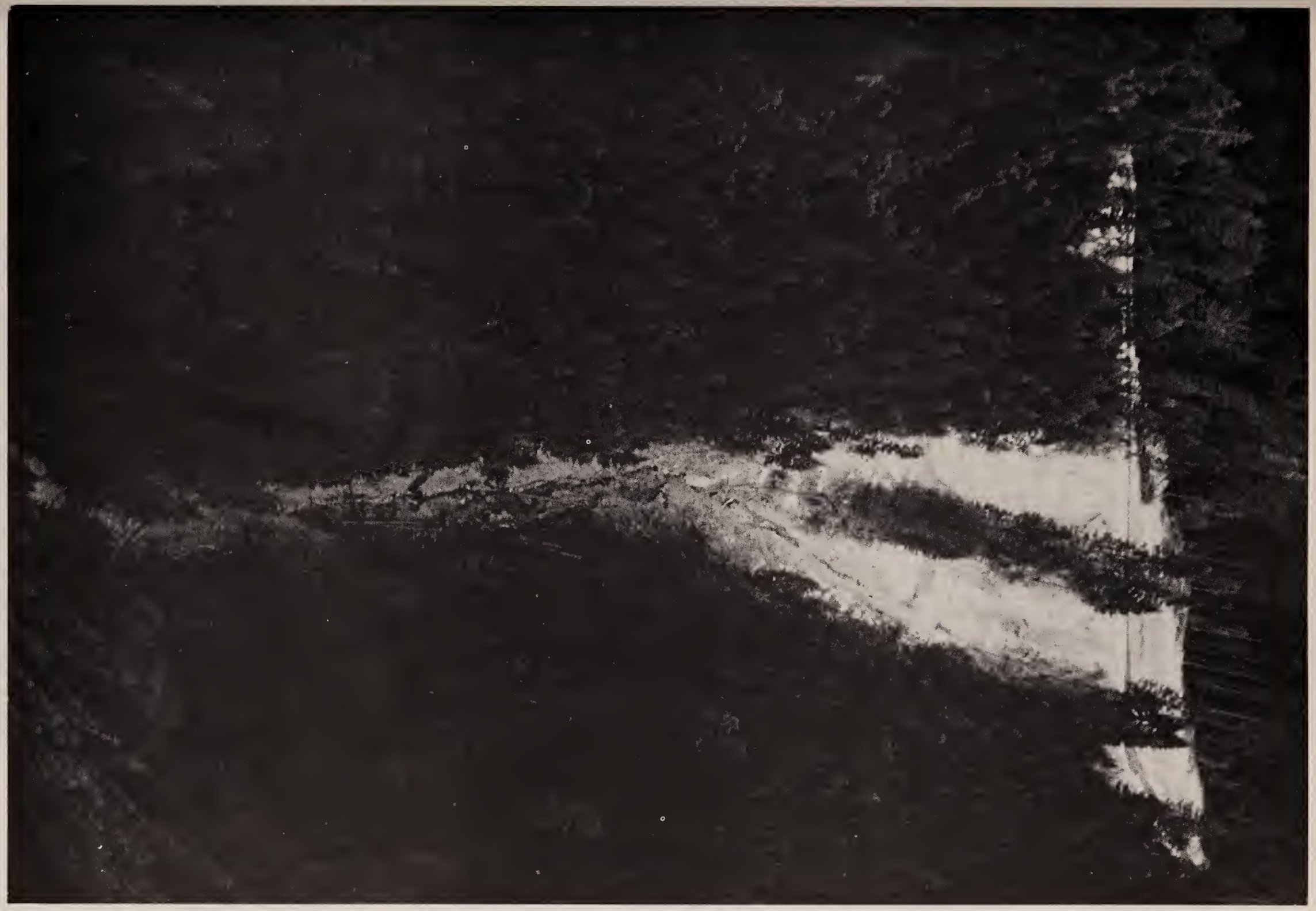


Figure 19. An aerial view of a debris avalanche that occurred on a Jason soil. Sidecast material overloaded the soil when the winter rains began sending debris down the steep slopes.

64-66/Y — Jason very gravelly loam - Digger gravelly loam association, 65 to 90 percent slopes. 10,331 acres. Shallow Jason soils make up about 60 percent of the area; and moderately deep, Digger soils make up about 40 percent of the area. The Jason soils are mostly on very steep headwalls, sideslopes, and sharp ridge crests. The Digger soils are mostly on steep sideslopes, and on narrow ridgetops. Mingled with the Jason soils are minor inclusions of Umpcoos soils and rock land. Mingled with the Digger soils are minor inclusions of Preacher soils.

64-66-R/Y — Jason very gravelly loam - Digger gravelly loam - rock land association, 65 to 90 percent slopes. 275 acres. The shallow Jason soils make up about 50 percent of the area; the moderately deep Digger soils make up 30 percent of the area; and rock land makes up about 20 percent of the area. The Jason soils and rock land are mostly on very steep headwalls, and slump escarpments. The Digger soils are mostly on narrow ridgetops and in drainage ways of dissected slopes. Minor inclusions of Umpcoos soils are mingled with the Jason soils; and of Preacher soils are mingled with the Digger soils.

64-66-57/YX — Jason very gravelly loam - Digger gravelly loam - Preacher clay loam association, 35 to 90 percent slopes. 807 acres. An association consisting of about 50 percent Digger soils, 30 percent Jason soils and 20 percent Preacher soils. Digger and Jason soils occur in an intermingled pattern on steep and very steep slopes. Preacher soils occur on narrow ridgetops and slopes with gradients less than 45 percent. About 70 percent of the slopes have gradients of 65 to 90 percent, and about 30 percent have gradients of 35 to 65 percent. Inclusions of Peavine soils occur on narrow rounded ridge noses.

64-66-564/Y — Jason very gravelly loam - Digger gravelly loam - Umpcoos very gravelly sandy loam association, 65 to 90 percent slopes. 3092 acres. The shallow, Jason soils with a paralithic contact, make up about 45 percent of the area; the moderately deep, Digger soils make up about 30 percent of the area; and the shallow Umpcoos soils with a lithic contact, make up about 25 percent of the area. The Jason and Umpcoos soils are mostly on very steep headwalls and slump escarpments. The Digger soils are mostly on narrow ridgetops and in drainage ways of dissected slopes. Mingled with the Jason and Umpcoos soils are minor inclusions of rock land. Mingled with the Digger soils are minor inclusions of Preacher soils.

DIGGER SERIES (66)

The Digger series consists of moderately deep, brown, loamy-skeletal soils occuring on Tyee sandstone. They are found on steep sideslopes, narrow ridges and headwalls at elevations of 600 to 2800 feet and in areas receiving more than 50 inches of precipitation.

Profile Description: Digger gravelly loam

Surface Soil:	0-8"	Dark brown gravelly loam, loose, slightly acid, (4 to 7 inches thick).
Subsoil:	8-39"	Yellowish brown gravelly silt loam, friable, slightly acid, (15 to 30 inches thick).
Substrata:	39"+	Highly fractured sandstone.

Representative Profile: Near rock quarry in the SE¼, NE¼, Sec. 13, T. 21 S., R. 6 W.

Variations: Solum depth and thickness ranges from 20 to 40 inches. Coarse fragment content ranges from 20 to 50 percent, with the lowermost horizon having up to 80 or 90 percent. The surface soil colors are very dark grayish brown or dark brown. Surface soil textures are gravelly loam or gravelly light clay loam. Subsoil colors are dark brown or dark yellowish brown. Subsoil textures are gravelly silt loam or very gravelly heavy silt loam.

Setting: Digger soils occur on steep ridges, smooth or dissected slopes of 40 to 80 percent in mountainous topography at elevations of 600 to 2800 feet. The regolith is medium or moderately fine textured gravelly colluvium derived from sandstone and siltstone. The climate is a modified maritime, with a summer dry season and an annual precipitation of 50 to 80 inches. The mean annual air temperature is 57° F., the average July temperature is 63° F., and the average January temperature is 40° F. The frost-free season is about 180 days.

The native vegetation is dominated by Douglas-fir, with maple and dogwood as inclusions. The understory consists of mixed shrubs, like salal, ocean spray, bracken fern, Oregon grape, sword fern and vine maple.

Digger soils are associated with the Umpcoos (564), Jason (64) and Preacher (57) soils. The Umpcoos and Jason soils occur on very steep topography and are less than 20 inches deep. Preacher soils are deep and are nonskeletal.

Soil Behavior and Recommendations:

Digger soils support stands of Douglas-fir with some hemlock and grand fir. Average site index is 140 for northerly aspects and is not available for southerly aspects.

The upper 20 inches of Digger soils have a moderate water holding capacity. The moderate amount of coarse fragments, the loam and silt loam textures, and the moderate amount of organic matter blend together to produce a water holding capacity that is between 2.5 and 3.5 inches. This amount of moisture is adequate for survival of Douglas-fir bare-root stock.

The success of bare-root Douglas-fir is high in recent clearcuts. Very steep direct south and west aspect areas of Digger soils are a problem to reforest. Recommend small clearcuts or strips to provide shade.

Burning slash does not produce a significant increase in erosion on northerly aspects. Losses of inorganic potassium and phosphorous do not appear to be significant. There are substantial losses of nitrogen, organic phosphorous and sulfur through volatilization and runoff. Recommendation is to spot burn where possible.

Road construction requires blasting and ripping. The material below the soils is usually fractured moderately hard sandstone.

Cut bank stability is high on slopes less than 75 percent and low on slopes over 75 percent.

Road construction can cause severe erosion on Digger soils when they are on sideslopes over 80 percent or in draws with slopes over 75 percent. When sidecast becomes saturated, it overloads the soil below it and triggers large debris avalanches. Recommendations are:

1. Avoid building roads in these soils.

2. If roads must be built, then roll the grade, keep them narrow, and end haul. Local experience has shown that these practices substantially reduced debris avalanches. Particular attention needs to be given to the way the pioneer road is constructed. In very steep segments no pioneer is recommended. In other areas where a pioneer road can be used a small cat with a U-shaped blade is recommended. Figure 32 shows a berm that is helpful to prevent sidecast from being lost over the side.

Selection of disposal sites requires as much care as does the location and construction of the road.

Sidecast from Digger soils on slopes less than 75 percent is normally stable. Sidecast responds well to seeding and mulching. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Rocking roads is necessary for winter hauling.

Most of the Digger soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this sort that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

Digger soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Mapping Units:

66-57/X — Digger gravelly loam - Preacher clay loam association, 35 to 65 percent slopes. 666 acres. This is an association with about 70 percent moderately deep, loamy-skeletal Digger soils and 30 percent deep, fine-loamy Preacher soils. Digger soils occur on steep sideslopes generally over 50 percent. Preacher soils occur on ridgetops, slopes less than 50 percent and on toe slopes. Inclusions of Apt soils also occur on toe slopes.

66-57-64/XY — Digger gravelly loam - Preacher clay loam - Jason very gravelly loam association, 35 to 90 percent slopes. 4313 acres. An association containing about 40 percent moderately deep, skeletal Digger soils, 40 percent deep, fine-loamy Preacher soils, and 20 percent shallow, skeletal Jason soils. Digger soils occur on steep side hills with slopes generally over 60 percent. Preacher soils occupy the more gentle slopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Jason soils occur intermingled with Digger soils and in very steep headwalls.

66-57-64/YX — Digger gravelly loam - Preacher clay loam - Jason very gravelly loam association, 35 to 90 percent slopes. 488 acres. An association containing about 40 percent moderately deep, loamy-skeletal Digger soils, 30 percent deep, fine-loamy Preacher soils, and 30 percent shallow, loamy-skeletal Jason soils. Digger soils occur on steep sideslopes. Preacher soils occupy the more gentle slopes. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Jason soils occur intermingled with Digger soils and in very steep headwalls.

66-64/XY — Digger gravelly loam - Jason very gravelly loam association, 35 to 90 percent slopes. 498 acres. An association containing about 70 percent moderately deep, loamy-skeletal Digger and 30 percent shallow, loamy-skeletal Jason soils. These two soils are intermingled on steep and very steep sideslopes. Their occurrence on the landscape within the mapping unit is unpredictable. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Inclusions of rock outcrop and pockets of Preacher soil occur.

66-64/YX — Digger gravelly loam - Jason very gravelly loam association, 35 to 90 percent slopes. 4827 acres. An association containing about 70 percent moderately deep, loamy-skeletal Digger and 30 percent shallow, loamy-skeletal Jason soils. These two soils are intermingled on steep and very steep sideslopes. Their occurrence on the landscape within the mapping unit is unpredictable. About 70 percent of the slopes have gradients between 65 and 90 percent; and about 30 percent have gradients between 35 and 65 percent. Inclusions of rock outcrop and pockets of Preacher soil occur.

66-64/Y — Digger gravelly loam - Jason very gravelly loam, 65 to 90 percent slopes. 7137 acres. An association containing about 70 percent moderately deep, loamy-skeletal Digger soils and 30 percent shallow, loamy-skeletal Jason soils. These two soils are intermingled on steep and very steep sideslopes. Their occurrence is unpredictable within the mapping unit. Up to 10 percent of the mapping unit can be rock outcrop.

66-64/Yn — Digger gravelly loam - Jason very gravelly loam, 65 to 90 percent slopes, northerly aspect. 1550 acres. An association containing about 70 percent moderately deep, loamy-skeletal Digger soils and 30 percent shallow, loamy-skeletal Jason soils. These two soils are intermingled on steep and very steep sideslopes. Their occurrence is unpredictable within the mapping unit. Up to 10 percent of the mapping unit can be rock land.

66-64-57/XY — Digger gravelly loam - Jason very gravelly loam - Preacher clay loam association, 35 to 90 percent slopes. 1130 acres. An association consisting of about 50 percent moderately deep, loamy-skeletal Digger soils; 30 percent shallow, loamy-skeletal

Jason soils; and 20 percent deep, fine-textured Preacher soils. Digger and Jason soils occur in an intermingled pattern on steep and very steep slopes. Preacher soils occur on narrow ridgetops and slopes with gradients less than 45 percent. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Inclusions of Honeygrove and Peavine soils are found on rounded ridge noses and ridgetops.

66-64-57/YX — Digger gravelly loam - Jason very gravelly loam - Preacher clay loam association, 35 to 90 percent slopes. 12,383 acres. An association consisting of about 50 percent moderately deep, loamy-skeletal Digger soils; 30 percent shallow, loamy-skeletal Jason soils; and 20 percent deep, fine-loamy Preacher soils. Digger and Jason soils occur in an intermingled pattern on steep and very steep slopes. Preacher soils occur on narrow ridgetops and slopes with gradients less than 45 percent. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Inclusions of Peavine soils occur on narrow rounded ridge noses.

66-64-57/Y — Digger gravelly loam - Jason very gravelly loam - Preacher clay loam association, 65 to 90 percent slopes. 298 acres. An association consisting of about 40 percent moderately deep, loamy-skeletal Digger soils; 40 percent shallow, loamy-skeletal Jason soils; and 20 percent deep, fine-loamy Preacher soils. Digger and Jason soils occur in an intermingled pattern on steep and very steep slopes. Preacher soils occur on narrow ridgetops and slopes with gradients less than 45 percent. Inclusions of rock land are mingled with the Jason and Digger soils.

66-64-R/Y — Digger gravelly loam - Jason very gravelly loam - Rock land association, 65 to 90 percent slopes. 2428 acres. An association with about 40 percent moderately deep, loamy-skeletal Digger soils; 30 percent shallow, loamy-skeletal Jason soils; and 30 percent rock land. Digger soils occur on very narrow ridgetops and at the base of steep slopes. Jason soils and rock land occur on very steep sideslopes. Commonly, the rock land is long exposures of thick massive beds of sandstone. Inclusions of Preacher soils are mingled with the Digger soils.

ZANGO SERIES (70)

The Zango series consists of light colored, shallow, loamy-skeletal soils formed in colluvium from volcanic rocks in areas receiving from 60 to 90 inches of precipitation. They occur on very steep slopes in the Cascade Mountains at elevations of 500 to 3200 feet.

Profile Description: Zango very gravelly sandy loam

Surface Soil:	0-10"	Grayish brown, very gravelly sandy loam, very friable, medium acid, (6 to 12 inches thick).
Subsoil:	10-17"	Brown very gravelly loam, friable, strongly acid, (2 to 10 inches thick).
Substrata:	17"+	Hard welded tuff.
Representative Profile:	SE¼, NW¼, Sec. 30, T. 24 S., R. 1 W., on 24-1-25.1 road.	

Variations: Depth to hard bedrock is between 10 and 20 inches. Rock fragment content ranges from 50 to 80 percent (see Figure 20). The color of the surface soils is gray, grayish brown, dark grayish brown, or brown. The texture of the surface horizon is very gravelly sandy loam or very gravelly loam. The color of the subsoil is brown, dark brown, dark yellowish brown, yellowish brown or strong brown. The texture of the subsoil is very gravelly loam, very gravelly clay loam, or very gravelly sandy loam.

Figure 20. A profile of Zango soil. Rock fragment content ranges from 50 to 80 percent.

Setting: Zango soils are on very steep dissected sideslopes at elevations of 500 to 3200 feet in the Cascade Mountains. The soils are forming in gravelly colluvium from light colored andesite, tuffs, and breccia. The climate has cool, moist winters and warm dry summers. The annual precipitation is from 60 to 90 inches. The soils are dry at depths of 4 to 12 inches for less than 45 days during the summer period. Average annual temperature is 45° F. to 53° F., average January temperature is about 37° F., and the average July temperature is about 63° F. The frost-free period is 160 to 200 days. The native vegetation is dominated by Douglas-fir, mixed with madrone. The understory consists of vine maple, salal, red huckleberry and sword fern.

Zango soils are associated with the moderately deep, loamy-skeletal Twindar soils; rock land; the dark surface layered, shallow, loamy-skeletal Kilchis soils; the dark surface layered, moderately-deep, loamy-skeletal Harrington soils; and the deep, loamy-skeletal Klickitat soils. On adjacent frigid sites at higher elevations, Zango soils are associated with soils of the shallow, loamy-skeletal Winberry series, and the moderately deep, loamy-skeletal Holderman series.

Soil Behavior and Recommendations:

Zango soils support stands of scattered Douglas-fir. Average site index is 103 for northerly aspects and 90 for southerly aspects.

The soil has a low water holding capacity. The high amount of coarse fragments, the loam texture, and the low amount of organic matter produce a water holding capacity that is between 1.0 and 2.0. This amount of moisture is adequate for survival of Douglas-fir on northerly aspects. On southerly aspects it is not.

Clearcutting is recommended on northerly aspects. Partial cutting or strip cutting is recommended for southerly aspects. The number of trees on either aspect is usually below normal stocking. It takes fewer trees per acre to fully stock this soil. Recommendations are to identify the number of acres of these soils and reduce the volume per acre that normal yield tables say will be produced.

Zango soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Broadcast, hot, slash burning does cause erosion on Zango soils when they occur on slopes over 70 percent southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity and makes it harder for seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn these soils.

Burning slash does not produce a significant increase in erosion on northerly aspects. Recommendation is to spot burn where possible.

Road construction requires mostly blasting. The material below the soil is usually hard volcanic rocks.

Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out on slopes over 80 percent. End hauling is recommended.

Sidecast from Zango soil on slopes less than 80 percent is normally stable. Sidecast does not respond well to seeding and mulching. There are very few fines. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Mapping Units:

70-53-R/Y	Zango very gravelly sandy loam - Twindar very gravelly loam - Rock land association, 65 to 90 percent slopes. 1065 acres. The shallow Zango soils make up about 45 percent of the association, the moderately deep Twindar make up about 35 percent and rock land makes up the remaining 20 percent of the association. The Zango series are mostly on the upper parts of the very steep sideslopes and on headwalls that have not recently had landslides. The Twindar soils occur on the steep sideslopes, ridgetops, and gentler topography in the unit. Rock land occurs on very steep sideslopes, headwalls, and adjacent to streams. Mingled with the soils in this association are the deep Klickitat and moderately deep Harrington soils.
70-53s-R/Y	Zango very gravelly sandy loam - Twindar gravelly overlay phase - Rock land association, 65 to 90 percent slopes. 1725 acres. The shallow Zango soils make up about 45 percent of the association, the moderately-deep, Twindar make up about 35 percent and rock land makes up the remaining 20 percent of the association. The Zango soils are mostly on the upper parts of the very steep sideslopes and on headwalls that have not recently had landslides. The Twindar soils occur on the steep sideslopes, ridgetops, and gentler topography in the unit. Rock land occurs on very steep sideslopes, headwalls, and adjacent to streams. Mingled with the soils in this association are the deep Klickitat and moderately deep Harrington soils.

70-R-53s/Yn	Zango very gravelly sandy loam - Rock land - Twindar gravelly overlay phase association, 65 to 90 percent slopes, northerly aspect. 367 acres. The shallow Zango soils make up about 45 percent of the association, rock land makes up about 35 percent, and the moderately deep Twindar gravel overlap phase soils make up the remaining 20 percent. The Zango soils are mostly on the upper parts of the very steep sideslopes and in headwalls. The rock land occurs on very steep sideslopes, headwalls, and adjacent to streams. Mingled with the soils in this association are the deep Klickitat and moderately deep Harrington soils.

SHIVIGNY SERIES (300)

The Shivigny series consists of deep, red strongly developed, clayey-skeletal soils formed in stony fine-textured colluvium from andesite, breccia and tuff in areas receiving from 50 to 65 inches of precipitation. They occur on gently sloping to moderately steep ridgetops and sideslopes in the Cascade Mountains at elevations of 1500 to 3200 feet.

Profile Description: Shivigny gravelly loam

Surface Soil:	0-10"	Dark reddish brown, gravelly loam, very friable, slightly acid, (8 to 15 inches thick).
Subsoil:	10-70"	Yellowish red very stony clay, firm, medium acid, (30 to 70 inches thick).
Substrata:	70"+	Partially weathered andesite.
Representative Profile:	Sec. 19, T. 27 S., R. 2 W., on the 27-2-19.0 road 800 feet south of the junction with the 27-2-19.1 road.	

Variations: Depth to bedrock ranges from 40 to over 80 inches. Rock fragment content ranges from 20 to 50 percent in the upper part, and from 35 to 80 percent in the lower part. The color of the surface layer is dark reddish brown, reddish brown, or dark brown. The texture of the surface soil is very gravelly loam, very gravelly clay loam, gravelly loam, or gravelly clay loam. The color of the subsoil is yellowish red, red, or dark red. The texture of the subsoil is very stony clay, very stony silty clay, or very gravelly silty clay.

Setting: Shivigny soils are on gently sloping ridgetops and moderately steep sideslopes with gradients up to 35 percent in the Cascade Mountains at elevations of 1500 to 3200 feet. These soils developed in cobbly and stony fine-textured colluvium from andesite, tuff and breccia. The winters are cool and moist, and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for less than 45 days during the summer period. The annual precipitation is from 50 to 65 inches. Mean annual temperature is 48° to 53° F., the average January temperature is about 37° F., and the average July temperature is about 63° F. The average frost-free period is 160 to 200 days. Native vegetation has a canopy of Douglas-fir, western red cedar, and grand fir. The understory consists of salal, red huckleberry, and sword fern.

Shivingy soils are associated with soils of the deep, red, clayey, nonskeletal Honeygrove series; the deep, red, clayey weakly developed, Blachly series; the deep, loamy-skeletal Klickitat series; the moderately deep, loamy-skeletal Harrington series; and the shallow, loamy-skeletal Kilchis series.

Soil Behavior and Recommendations:

Shivigny soils support productive stands of Douglas-fir with some western red cedar and grand fir. The average site index is 117 for northerly aspects and 117 for southerly aspects. The stand density is usually normal for Douglas-fir.

Clearcutting is the recommended harvesting practice for Shivigny soils. These soils occur in moist environments where the growth of Douglas-fir is good. Aspect does not play a strong role in tree growth on Shivigny soils. Competing vegetation is usually not a problem. Occasionally a very dense stand of Ceanothus velutinus will become established after a hot burn. If the Douglas-fir does not get established the first two years after the burn, the ceanothus can be a strong competitor. Recommendations are to control the density of the ceanothus by spot burning or seeding and to get the Douglas-fir established the first year after harvesting.

For areas that have heavy stands of ceanothus with little or no Douglas-fir stocking, the recommendations are to use herbicides, mechanical scarification, and plant.

Shivigny soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Shivigny soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Shivigny soils have a moderately high water holding capacity. The 30 to 50 percent coarse fragment content, the heavy loam texture of the surface soil plus the clay loam texture of the upper part of the subsoil, and the high organic matter content blend together to produce a water holding capacity that is between 3.0 and 4.0 inches. This amount of moisture is adequate for the survival of bare-root Douglas-fir seedlings in a clearcut. The success of bare-root Douglas-fir seedlings is high. If the surface soil has a high content of coarse fragments, the recommendation is to scalp away the gravelly material and plant in a layer with a higher water holding capacity. Shading is not needed on Shivigny soils.

Burning slash does not produce a significant increase in erosion on Shivigny soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendations are to spot burn wherever possible.

Shivigny soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendations are to seed units in Shivigny soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period, the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is moderately hard in Shivigny soils. The material below the soil is usually large boulders of basalt. Cut bank stability is high on slopes less than 50 percent and low on slopes over 50 percent. The most common failures are half-moon shaped slumps of the cut bank that fill ditches and disrupt the normal flow of ditch water.

Sidecast from Shivigny soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine-textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Shivigny soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Shivigny soils are moderately well suited for helipond locations and poorly suited as fill for small earth dams. The soil contains a high percentage of coarse fragments which can cause leaks in the bottom of a pond. The coarse fragments are very difficult to remove to make a suitable fill material.

Heliponds located in Shivigny need a sealer for the bottom. Usually there is a nearby area of Honeygrove soil that is well suited as a sealer. Most of the time 6 inches provides an adequate seal.

Fire trail construction done by hand has the least impact on the soil. If tractors must be used, build closely spaced water bars.

Mapping Units: Shivigny is a minor series that occurs in association soils.

KLICKITAT SERIES (323)

The Klickitat series consists of deep, reddish brown, loamy-skeletal soils formed in colluvium from basic igneous rocks in areas receiving from 60 to 90 inches of precipitation. They occur on ridges and steep, smooth or dissected slopes in mountainous topography at elevations of 500 to 4000 feet.

Profile Description: Klickitat gravelly loam

Surface Soil:	0-9"	Very dark grayish brown, gravelly loam, friable, medium acid, (6 to 12 inches thick).
Subsoil:	9-60"	Dark brown very gravelly silty clay loam, friable, strongly acid, (15 to 20 inches thick).
Substrata:	60"+	Fractured basalt.
Representative Profile:	One-half mile from end of 16.1 road in the NW¼, SW¼, Sec. 5, T. 25 S., R. 2 W.	

Variations: Depth to fractured bedrock ranges from 40 to over 60 inches. Rock fragment content ranges from 15 to 50 percent. The color of the surface soils is very dark grayish brown or dark reddish brown. The texture of the surface soil is gravelly loam, gravelly clay loam, or clay loam. The color of the subsoil is dark brown or dark reddish brown. The texture of the subsoil is very gravelly light silty clay loam, gravelly silty clay loam, gravelly clay loam, or silty clay loam.

Setting: Klickitat soils occur on ridges and steep, smooth or dissected slopes in mountainous topogrpahy at elevations of 500 to 4000 feet. Slope gradients dominantly range from 25 to 80 percent. These soils are forming in gravelly colluvium from basic igneous rocks. Mean annaul precipitation is 60 to 90 inches. Mean annual temperature is 45° to 53° F., average January temperature is 37° F., and average July temperature is 63° F. Average frost-free period is 160 to 200 days. Natural vegetation is Douglas-fir and some hemlock. The understory consists of salal, sword fern, vine maple, ocean spray and red huckleberry.

Klickitat soils are associated with Blachly, Harrington and Kilchis soils. Blachly soils occur on less steeply sloping topography and contain less than 35 percent coarse fragments in the B horizons. Harrington soils are moderately deep and occur on steeper slopes. Kilchis soils are less than 20 inches to bedrock and occupy the steepest slopes.

Soil Behavior and Recommendations:

Klickitat soils support productive stands (see Figure 21) of Douglas-fir with some hemlock, western red cedar and grand fir. The average site

Figure 21. Typical landscape and timber stands for Klickitat soils.

index is not available for northerly aspects. The only available site index is for a southerly aspect in Brushy Ridge. It is 130. This site index should be used with caution. It was taken in an area where there have been 2 or 3 fires in the last 100 years. It was also taken at the upper limits of elevation for Klickitat soils.

Road construction is usually easy. The material below the soil is usually rippable volcanic rocks. Some blasting will be needed on deep cuts. Cut bank stability is high on slopes less than 60 percent, medium on slopes between 60 and 80 percent, and low on slopes over 80 percent.

The most common failure is sidecast sluicing out on slopes over 80 percent in draws. Another common failure occurs when a pocket of Klickitat soil is on slopes over 70 percent and a road is built through it. Figures 22 and 23 illustrate these failures. The cut bank slumps, bringing with it large volumes of soil. Recommend careful road location and end haul segments over 80 percent.

The safest location for roads that are built through Klickitat soil is on slopes less than 60 percent.

Sidecast from Klickitat soils on slopes less than 60 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Sediment that is produced when these soils are disturbed is silty and tends to settle slowly in runoff water. Recommendations are to seed, mulch, and fertilize new road construction before the winter rains begin.

Rocking roads in Klickitat soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Fire trails built by hand have the least impact on the soil. When tractors are used for this purpose, closely spaced water bars are recommended.

Klickitat soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in Klickitat soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Burning slash does not produce a significant increase in erosion on Klickitat soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendation is to spot burn wherever possible.

Figure 22. The type of failure that can be expected when a pocket of Klickitat soil is cut with a road on slopes over 70 percent.

Figure 23. A sidecast failure when Klickitat soil is placed on slopes over 80 percent.

The upper 20 inches of Klickitat soils have a high water holding capacity. The moderate amount of coarse fragments, the loam texture of the surface soil plus the silty clay loam texture of the upper part of the subsoil, and the moderate to high organic matter content all blend to produce a water holding capacity that is between 3.0 and 3.5 inches. This amount of moisture is adequate for survival of Douglas-fir bare-root seedlings in clearcuts. The success of bare-root Douglas-fir seedlings is high. Shading is not needed in Klickitat soils.

Most of the Klickitat soils occur on slopes too steep for tractor logging. Cable logging is the recommended practice. Occasionally this soil is on slopes gentle enough for tractor yarding. Klickitat soils have a medium clay content and are not as easily compacted as the red clay soils. On areas that have slopes of less than 35 percent, Klickitat soils can safely be tractor-logged provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. All major skid trails be water barred.

Clearcutting is the recommended harvesting practice for Klickitat soils.

Competition from grass and other species is not a problem on northerly aspects but is a problem on south exposures near the North Umpqua River at low elevations. The recommended practice is to clearcut both aspects but apply herbicides to low elevation southerly facing units for one year following planting. Units should be planted the first winter following logging. This practice helps the trees to become established before the unit is invaded by pioneering vegetation.

Klickitat soils are moderately well suited for heliponds. Deep cuts made in this soil can get into porous material. A sealer of 6 to 10 inches of compacted red clay is recommended.

The subsoil of Kilckitat soils is well suited for material to construct small earth dams. The amount of clay and sand is favorable for compaction.

Mapping Units:

323-29/X	Klickitat gravelly loam - Harrington very gravelly clay loam association, 35 to 65 percent slopes. 5180 acres. The deep Klickitat soils make up about 70 percent of the association and the moderately deep

Harrington soils make up about 30 percent. Klickitat soils occur on recent landslides and gentle sideslopes. Harrington soils occur on the steeper portions of the mapping unit. Inclusions of Honeygrove soils occur on benches.

323-29/Y — Klickitat gravelly loam - Harrington very gravelly clay loam association, 65 to 90 percent slopes. 5427 acres. The deep Klickitat soils make up about 60 percent of the association and the moderately deep Harrington soils make up about 40 percent of the association. Klickitat soils occur on concave positions. Harrington soils occur on the steeper portions of the mapping unit such as narrow ridge noses. Inclusions of Kilchis soils occur on steep headwalls.

323-29-35/YX — Klickitat gravelly loam - Harrington very gravelly clay loam - Kilchis stony loam association, 35 to 90 percent slopes. 1353 acres. The deep Klickitat soils make up about 40 percent of the association, the moderately deep Harrington soils make up about 35 percent and the shallow Kilchis soils make up the remaining 25 percent. Klickitat soils occur on concave positions where slopes are less than 50 percent. Harrington soils occur on steep ridge noses and ridgetops. Kilchis soils occur on very steep slopes. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Inclusions of Blachly soils are mingled with the Klickitat soils, and rock land is mingled with the Kilchis soils.

323-53/YX — Klickitat gravelly loam - Twindar very gravelly loam association, 35 to 90 percent slopes. 3171 acres. Deep dark brown, loamy-skeletal Klickitat soils make up about 60 percent of the area, and moderately deep, yellowish brown, loamy-skeletal Twindar soils make up about 40 percent of the area. The Klickitat soils are mostly in the draws of dissected sideslopes and on toe slopes. The Twindar soils are mostly on the interfluves of dissected sideslopes. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Klickitat soils are minor inclusions of the deep, nonskeletal Blachly soils and the moderately deep, loamy-skeletal Harrington soils. Mingled with the Twindar soils are minor inclusions of the light colored, shallow Zango soils, the dark colored, shallow Kilchis soils and rock land.

ABEGG SERIES (360)

The Abegg series consists of deep, red, loamy-skeletal, strongly developed soils formed in colluvium from metavolcanic rocks in areas receiving between 35 and 60 inches of precipitation. They occur on moderately steep to very steep slopes in the Klamath Mountains at elevations of 700 to 2800 feet.

Profile Description: Abegg gravelly loam

Surface Soil:	0-7"	Dark brown gravelly loam, friable, slightly acid, (4 to 15 inches thick).
Subsoil:	7-41"	Reddish brown very gravelly clay loam, firm, medium acid, (30 to 61 inches thick).
Substrata:	41"+	Weathered metavolcanic rock.
Representative Profile:	Approximately 45 miles up the 29-4-20.0 road in the SE¼, SW¼, Sec. 18, T. 29 S., R. 4 W.	

Variations: Depth to weathered bedrock ranges from 40 to over 60 inches. Rock fragment content ranges from 20 to 50 percent in the surface layer, and from 45 to 70 percent in the subsoil. The color of the surface layer is dark brown, very dark grayish brown, or dark yellowish brown. The texture of the surface soil is gravelly loam, or very gravelly loam. The color of the subsoil is reddish brown, strong brown, yellowish red, or red. The texture of the subsoil is very gravelly clay loam or very cobbly clay loam.

Setting: The Abegg soils are on moderately steep to very steep slopes with gradients of up to 70 percent in the Klamath Mountains at elevations of 700 to 2800 feet. The soils formed in gravelly and cobbly medium textured colluvium from metavolcanic rocks. The winters are cool and moist, and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for more than 45 days during the dry summer period. The mean annual precipitation is from 35 to 60 inches. Average annual temperature is 48° to 55° F., average January temperature is about 38° F., and average July temperature is about 64° F. The frost-free period is 160 to 200 days. The native vegetation is dominantly Douglas-fir, ponderosa pine, and madrone. The understory is a mixture of hazel, ocean spray, salal, whipplea, poison oak, buckbrush and grasses.

Abegg soils are associated with the nonskeletal, deep, fine-loamy Holland soils from metavolcanics, and the deep, clayey Lettia soils from metavolcanics. At higher elevations in the frigid zone, Abegg soils merge with the moderately deep, loamy-skeletal Holderman soils, and the shallow, loamy-skeletal Winberry soils.

Soil Behavior and Recommendations:

Abegg soils support productive stands of Douglas-fir with incense cedar, madrone and ponderosa. The average site index is 130 for northerly aspects and 105 for southerly aspects.

Road construction is generally easy. The material below the soil is usually deeply weathered volcanic rocks of the Applegate and Rogue Formations. Most of the material is rippable. Cut bank stability is high on slopes of less than 60 percent, medium on slopes between 60 and 70 percent, and low on slopes over 70 percent.

The most common failure is a combination of the cut bank slumping in and the sidecast sluicing out when roads are built in this soil on slopes over 70 percent. Sidecast failures cause the most damage. Recommend end hauling segments that are over 70 percent.

The safest location for roads that are built through Abegg soil is on slopes of less than 60 percent.

Sidecast from Abegg soils on slopes of less than 60 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Sediment that is produced when these soils are disturbed is silty and tends to settle slowly in runoff water. Recommendations are to seed, mulch, and fertilize new road construction before the winter rains begin.

Rocking roads in Abegg soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Fire trails built by hand have the least impact on the soil. When tractors are used for this purpose, closely spaced water bars are recommended.

The upper 20 inches of Abegg soils have a low water holding capacity. The high amount of coarse fragments, the gravelly loam texture of the surface soil and subsoil, and the low organic matter content all blend to produce a water holding capacity that is between 1.5 and 2.0 inches. This amount of moisture is adequate for survival of Douglas-fir bare-root stock on northerly aspects. Survival success is high on northerly aspects provided seedlings are planted the first year after logging and herbicides are used successfully to control competing vegetation.

On southerly aspects, competing vegetation and low water holding capacity are a problem. Recommendations are to use very small clearcuts or strip clearcuts and herbicides. The small clearcuts will provide shade along the edges and also allow a helicopter to apply herbicides.

Broadcast, hot, slash burning does cause erosion on Abegg soils when they occur on 70 percent or steeper southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity and makes the site less conducive for seedling survival. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn the steep southerly aspects. Where slash is so dense that it prevents planting the area, spot burning is recommended.

Northerly aspects are not as critical for burning.

Most of the Abegg soils occur on slopes too steep for tractor logging. Cable logging is the recommended practice. Occasionally there are areas of this soil that are flat for tractor yarding. Abegg soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, Abegg soils can safely be tractor logged provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.
2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart during the driest part of the year.
3. All major skid trails be water barred.

Clearcutting is the recommended harvesting practice for Abegg soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult because aerially applied herbicides do not penetrate the canopy.

Abegg soils are poorly suited for helipond locations because of their high coarse fragment content. They are marginal for material to construct small earth dams because of the low clay content. A sealer of 6 to 10 inches of compacted red clay is recommended for heliponds built in this soil.

Mapping Units:

360-731/X	Abegg gravelly loam - Vena gravelly loam association, 35 to 65 percent slopes, southerly aspect. 988 acres. The deep Abegg soils occur on sideslopes, ridgetops, ridge noses, and recent landslides. The moderately deep Vena soils occur above steep draws and headwalls. Abegg soils occupy about 70 percent of the association and Vena about 20 percent. The remaining 10 percent is inclusions of deep red clayey Freezner soils that occupy the gentle portions of the association.

360-731/Xn Abegg gravelly loam - Vena gravelly loam association, 35 to 65 percent slopes, northerly aspect. 757 acres. The deep Abegg soils occur on sideslopes, ridgetops, ridge noses, and recent landslides. The moderately deep Vena soils occur above steep draws and headwalls. Abegg soils occupy about 70 percent of the association and Vena soils about 20 percent. The remaining 10 percent is inclusions of deep red clay Freezner soils that occupy the gentle portions of the association.

360-731/Y Abegg gravelly loam - Vena gravelly loam association, 65 to 90 percent slopes, southerly aspect. 7704 acres. The deep Abegg soils occur on sideslopes, ridgetops, and recent landslides. The moderately deep Vena soils occur on ridge noses, very narrow ridgetops and steep sideslopes. Abegg soils occupy about 60 percent while Vena soils make up about 30 percent. The remaining 10 percent is inclusions of deep Freezner soils and shallow Shippa soils.

360-731/Yn Abegg gravelly loam - Vena gravelly loam association, 65 to 90 percent slopes, northerly aspect. 1917 acres. The deep Abegg soils occur on sideslopes, ridgetops, and recent landslides. The moderately deep Vena soils occur on ridge noses, very narrow ridgetops, and steep sideslopes. Abegg soils occupy about 60 percent while Vena soils make up about 30 percent. The remaining 10 percent is inclusions of deep Freezner soils and shallow Shippa soils.

CHAMATE SERIES (362)

The Chamate series consists of deep, brown, loamy-skeletal soils formed in gravelly colluvium from welded tuffs in areas receiving from 40 to 55 inches of precipitation. Figures 24, 25 and 26 depict the formation of parent material for Chamate soils. They occur on ridgetops and sideslopes in the Cascade Mountains at elevations of 800 to 2500 feet.

Profile Description: Chamate very gravelly loam

Surface Soil:	0-15"	Dark grayish brown, very gravelly loam, friable, slightly acid, (10 to 18 inches thick).
Subsoil:	15-56"	Brown, very gravelly loam, friable, neutral, (30 to over 60 inches thick).
Substrata:	56"+	Hard welded tuff.
Representative Profile:	NE¼, NE¼, Sec. 13, T. 27 S., R. 3 W., 100 yards from the end of 27-3-13.1 road.	

Variations: Depth to hard welded tuff ranges from 40 to more than 100 inches. The rock fragment content ranges from 35 to 80 percent throughout the soil. The color of the surface soils is dark grayish brown, grayish brown or brown. The texture of the surface layer is very gravelly loam or gravelly sandy loam. The color of the subsoil is dark brown, brown, dark yellowish brown, or yellowish brown. The texture of the subsoil is very gravelly loam or very gravelly sandy loam.

Setting: Chamate soils are on ridge noses, in drainage ways of dissected slopes, and on concave toe slopes. The Chamate soils characteristically occur below escarpments of hard massive welded tuffs. Slope gradients range from 10 to 70 percent. Chamate soils formed from very gravelly colluvium from welded tuffs in the Cascade Mountains at elevations from 800 to 2500 feet. The winters are cool and moist, and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for more than 45 days during the summer period. Mean annual precipitation is from 40 to 55 inches. Average annual temperature is 50° to 55° F., average January temperature is 39° F., and average July temperature is 66° F. The frost-free period is 160 to 230 days. The native vegetation has a canopy of Douglas-fir and incense cedar. The understory is a mixture of salal, poison oak, and wild rose.

Chamate soils are associated with soils of the moderately deep, loamy-skeletal Vena soils; the shallow, loamy-skeletal Shippa soils; and the deep, red, clayey Freezner soils.

Figure 24. Bands of welded tuff commonly have columns or monoliths. Below bands of welded tuff is where Chamate soils occur.

Figure 25 (above). The surface weathering or flaking of the welded tuff that leads to the formation of gravelly colluvium shown in Figure 26 (left) which is the parent material for Chamate soil.

Soil Behavior and Recommendations:

Chamate soils support productive stands of Douglas-fir with some incense cedar. The average site index is not available for northerly aspects and is 110 for southerly aspects.

Road construction is usually easy. The material below the soil is loose fragments of welded tuff. The fragments are mostly smaller than 6 inches. Cut bank stability is high on slopes less than 60 percent, medium on slopes between 60 and 80 percent, and low on slopes over 80 percent.

The most common failure occurs when sidecast from this soil is placed on sideslopes over 80 percent. The sidecast sluices out. It is recommended not to build roads on this soil over 80 percent. If roads must be built, then end haul.

The safest location for roads that are built through Chamate soil is on slopes less than 60 percent.

Sidecast from Chamate soils on slopes less than 60 percent is normally stable. Both cut banks and sidecast respond poorly to seeding and mulching. Sediment that is produced when these soils are disturbed is coarse and tends to settle rapidly in runoff water. Recommendations are to locate roads on stable ground and not mulch new roads.

Rocking roads in Chamate soils is necessary for winter hauling. Surfacing can usually be obtained by using material from the cut bank. Temporary spurs do not need to be rocked.

The upper 20 inches of Chamate soils have a low water holding capacity. The high amount of coarse fragments, the loam texture of the surface soil and subsoil, and the low organic matter content all blend to produce a water holding capacity that is between 1.5 and 2.0 inches. This amount of moisture is adequate for survival of Douglas-fir bare-root stock on northerly aspects. The success of bare-root Douglas-fir seedlings is high on northerly aspects.

Clearcutting is the recommended harvesting practice for Chamate soils on northerly aspects.

Competition from grass and other species is not a problem on northerly aspects. However, on southerly aspects, competing vegetation and low water holding capacity are a problem. Recommendations are to use very small clearcuts or strip clearcuts and use herbicides. The small clearcuts will provide shade along the edges and also allow a helicopter to apply herbicides. For large clearcuts that were made in the past, herbicides and artificial shade are recommended.

Broadcast, hot, slash burning does cause erosion on Chamate soils when they occur on 70 percent or greater southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder to get seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn the steep southerly aspects. Where slash is so dense that it prevents planting the area, spot burning is recommended.

Northerly aspects are not as critical for burning.

Most of the Chamate soils occur on slopes too steep for tractor logging. Cable logging is the recommended practice. Occasionally there are areas of this soil that are gentle enough to use tractors for yarding. Chamate soils have a low clay content and are not as easily compacted. On areas that have slopes less than 35 percent, Chamate soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. All major skid trails be water barred.

Chamate soils are poorly suited for helipond locations because of the high amount of coarse fragments. They are poorly suited for material to construct small earth dams because of low clay content and high coarse fragment content. A sealer of 10 to 12 inches of compacted red clay is recommended for heliponds built in this soil.

Mapping Units:

362-741/X	Chamate very gravelly loam - Freezner loam association, 35 to 65 percent slopes. 1063 acres. The deep loamy-skeletal Chamate soils make up about 70 percent of the area while the deep, clayey Freezner occupies about 30 percent. Chamate soils occur on slopes below outcrops of welded tuff on gentle to steep slopes. Freezner soils occur on old landslides and broad ridgetops. This association contains inclusions of rock land, the shallow very gravelly Shippa soils and the moderately deep Vena soils.

KANID SERIES (370)

The Kanid series consists of deep, very gravelly, loamy, well-drained soils from sedimentary and metamorphic rocks in areas receiving 35 to 60 inches of precipitation. They occur on moderately steep to steep and very steep slopes in the Klamath Mountains at elevations of 600 to 3200 feet.

Profile Description: Kanid gravelly loam

Surface Soil:	0-8"	Very dark grayish brown, gravelly loam, friable, medium acid, (2 to 10 inches thick).
Subsoil:	8-45"	Brown, very gravelly loam, friable, medium acid, (30 to 50 inches thick).
Substrata:	45"+	Fractured metamorphic bedrock.
Representative Profile:	On the 19.0 road near its junction with the 11.0 road in the NE¼, SE¼, Sec. 11, T. 31 S., R. 8 W.	

Variations: Depth to bedrock ranges from 40 to more than 60 inches. Coarse fragment content ranges from 35 to 75 percent. Surface soil colors are very dark brown, dark brown, or very dark grayish brown. Subsoil colors are dark brown, brown, dark yellowish brown or strong brown. Surface textures are silt loam, gravelly silt loam, loam, or gravelly loam. Subsoil textures are very gravelly silt loam, very gravelly loam, or very gravelly light clay loam.

Setting: The Kanid soils occur on moderately steep to very steep sideslopes of the Klamath Mountains at elevations of 600 to 3200 feet. Slope gradients range from 10 to 80 percent but most are steeper than 35 percent. The soils formed in colluvium from metamorphic, sedimentary and volcanic rocks. The winters are cool and moist and the summers are warm and dry. Mean annual precipitation ranges from 35 to 70 inches. The mean annual air temperature ranges from 50° to 54° F., the mean January temperature centers on 35° F., and the mean July temperature centers on 70° F. The frost-free period ranges from 160 to 200 days. The native vegetation consists of Douglas-fir, incense cedar and madrone with an understory of whipplea and poison oak on south aspects and of salal and Oregon grape on north aspects.

The Kanid soils are associated with soils of the moderately deep, very gravelly, loamy Beekman series; the shallow, very gravelly Vermisa series; the moderately deep, clayey, very gravelly McGinnis series; and the deep, clayey Pollard and very gravelly, clayey Tishar series.

Soil Behavior and Recommendations:

Kanid soils support productive stands of Douglas-fir with incense cedar and ponderosa pine. The average site index is 145 for northerly aspects and 130 for southerly aspects in the Dillard Area and 130 for northerly aspects and 116 for southerly aspects in the South Umpqua Area.

Road construction requires ripping and some blasting. The material below the soil is usually highly fractured metasedimentary rocks or deep colluvium. Cut bank stability is high on slopes less than 70 percent, medium on slopes between 70 and 80 percent, and low on slopes over 80 percent.

The most common failure is the cut bank slumping when a road is cut through a deep pocket of this soil on slopes over 70 percent. These pockets occur mostly in draws like those on the Union Creek access road. When this soil is over weathered conglomerate, the cut banks and fills settle. Recommend rip rapping cut banks and fills on slopes less than 50 percent.

The safest location for roads that are built through Kanid soil is on slopes less than 70 percent, away from areas of weathered conglomerate.

Sidecast from Kanid soils on slopes less than 80 percent is normally stable. Sidecast responds well to seeding and mulching. Sediment that is produced when these soils are disturbed is coarse textured and tends to settle rapidly in runoff water. Recommendations are to seed, mulch, and fertilize sidecast of new road construction before the winter rains begin. Cut banks do not respond very well to seeding. Generally there is a high proportion of rocks.

Rocking roads in Kanid soils is necessary for winter hauling.

Fire trails built by hand have the least impact on the soil. When tractors are used for this purpose, closely spaced water bars are recommended.

Kanid soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in Kanid soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

The upper 20 inches of Kanid soils have a low to medium water holding capacity. The low to medium amount of coarse fragments, the loam texture of the surface soil and subsoil, and the low organic matter content all blend to produce a water holding capacity that is between 1.5 and 2.5 inches. This amount of moisture is adequate for survival of Douglas-fir on northerly aspects in clearcuts. The success of bare-root Douglas-fir seedlings is high on northerly aspects in most places.

However, at low elevations around Canyonville, Boomer Hill, Days Creek, and Tiller, northerly aspects are invaded with competing vegetation. Without herbicides, regeneration success is poor. With successful herbicide treatments, regeneration success is high.

For southerly aspects, competing vegetation and low water holding capacity are a problem.

Clearcutting is recommended for both northerly and southerly aspects. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

For southerly aspects recommendations are to use strip clearcuts or small clearcuts. These small openings will provide shade along the edges and also allow a helicopter to apply herbicides. For large clearcuts that were made in the past, herbicides and artificial shade are recommended.

Broadcast, hot, slash burning does cause erosion on Kanid soils when they occur on 70 percent or steeper southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder for seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn the steep southerly aspects. Where slash is so dense that it prevents planting the area, spot burning is recommended.

Northerly aspects are not as critical for burning.

Most of the Kanid soils occur on slopes too steep for tractor logging. Cable logging is the recommended practice. Occasionally there are areas of this soil that are gentle enough to use tractors for yarding. Kanid soils have a low clay content and are not as easily compacted. On areas that have slopes less than 35 percent, Kanid soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. All major skid trails be water barred.

Kanid soils are poorly suited for helipond locations because of the porous nature of the subsoil and parent material. Also, they are on steep slopes. They are poorly suited for material to construct small earth dams because of low clay content and high coarse fragment content.

Mapping Units:

370-371/W — Kanid gravelly loam - Beekman gravelly loam association, 10 to 35 percent slopes, predominantly southerly. 3165 acres. Deep, loamy-skeletal Kanid soils make up about 60 percent of the area, and moderately deep, loamy-skeletal Beekman soils make up about 40 percent of the area. The Kanid soils are dominantly in the drainage ways of dissected sideslopes, and on the smooth sideslopes less than 50 percent. The Beekman soils are mostly on the steeper sideslopes and on the interfluves of the dissected sideslopes. Mingled with the Kanid soils are minor inclusions of the red, clayey-skeletal McGinnis and Tishar soils. Mingled with the Beekman soils are minor inclusions of the shallow Vermisa soils.

370-371/Wn — Kanid gravelly loam - Beekman gravelly loam association, 10 to 35 percent slopes, predominantly northerly. 1395 acres. Deep, loamy-skeletal Kanid soils make up about 60 percent of the area, and moderately deep, loamy-skeletal Beekman soils make up about 40 percent of the area. The Kanid soils are dominantly in the drainage ways of dissected sideslopes, and on the smooth sideslopes less than 50 percent. The Beekman soils are mostly on the steeper sideslopes and on the interfluves of the dissected sideslopes. Mingled with the Kanid soils are minor inclusions of the red, clayey-skeletal McGinnis and Tishar soils. Mingled with the Beekman soils are minor inclusions of the shallow Vermisa soils.

370-371/X — Kanid gravelly loam - Beekman gravelly loam association, 35 to 65 percent slopes, predominantly southerly. 10,913 acres. Deep, loamy-skeletal Kanid soils make up about 60 percent of the area, and moderately deep, loamy-skeletal Beekman soils make up about 40 percent of the area. The Kanid soils are dominantly in the drainage ways of dissected sideslopes, and on the smooth sideslopes less than 50 percent. The Beekman soils are mostly on the steeper sideslopes and on the interfluves of the dissected sideslopes. Mingled with the Kanid soils are minor inclusions of the red, clayey-skeletal McGinnis and Tishar soils. Mingled with the Beekman soils are minor inclusions of the shallow Vermisa soils.

370-371/Xn — Kanid gravelly loam - Beekman gravelly loam association, 35 to 65 percent slopes, predominantly northerly. 2402 acres. Deep, loamy-skeletal Kanid soils make up about 60 percent of the area, and moderately deep, loamy-skeletal Beekman soils make up about 40 percent of the area. The Kanid soils are mostly in the drainage ways of dissected sideslopes, and on smooth sideslopes less than 50 percent. The Beekman soils are mostly on the steeper sideslopes, and on the interfluves of dissected sideslopes. Mingled with the Kanid soils are minor inclusions of the red, clayey-skeletal McGinnis and Tishar soils. Mingled with the Beekman soils are minor inclusions of the shallow Vermisa soils.

370-371/Y — Kanid gravelly loam - Beekman gravelly loam association, 65 to 90 percent slopes, predominantly southerly. 5064 acres. Deep, loamy-skeletal Kanid soils make up about 50 percent of the area, and moderately deep, loamy-skeletal Beekman soils make up about 40 percent of the area. The Kanid soils are dominantly in the drainage ways of dissected sideslopes and on the steep sideslopes. The Beekman soils are mostly on the very steep sideslopes and in the headwalls. Mingled with the Kanid soils are minor inclusions of the red, clayey-skeletal McGinnis soils. Mingled with the Beekman soils are minor inclusions of the shallow Vermisa soils and rock land.

370-371/Yn — Kanid gravelly loam - Beekman gravelly loam association, 65 to 90 percent slopes, northerly aspect. 729 acres. Deep, loamy-skeletal Kanid soils make up about 50 percent of the area, and moderately deep, loamy-skeletal Beekman soils make up about 40 percent of the area. The Kanid soils are dominantly in the drainage ways of dissected sideslopes, and on the steep sideslopes. The Beekman soils are mostly on very steep sideslopes and in the headwalls. Mingled with the Kanid soils are minor inclusions of the red, clayey-skeletal McGinnis soils. Mingled with the Beekman soils are minor inclusions of the shallow Vermisa soils and rock land.

370-382-371/X — Kanid gravelly loam - Tishar gravelly silty clay loam - Beekman gravelly loam association, 35 to 65 percent slopes. 7321 acres. Deep, loamy-skeletal Kanid soils occupy about 35 percent of the unit, deep, clayey-skeletal Tishar soils make up 35 percent and moderately deep Beekman soils. Kanid and Tishar soils occur intermingled on benches and middle and lower slopes positions. The Beekman soils are on the steeper slopes. Minor inclusions consist of deep clayey Pollard soils mingled with Kanid and Tishar soils. Wet spots are common on gentle slopes.

BEEKMAN SERIES (371)

The Beekman series consists of moderately deep, very gravelly, loamy well drained soils from sedimentary and metamorphic rocks in areas receiving 35 to 60 inches of precipitation. They occur on steep to very steep slopes in the Klamath Mountains at elevations of 600 to 3200 feet.

Profile Description: Beekman very gravelly loam

Surface Soil:	0-7"	Very dark grayish brown, very gravelly loam, friable, medium acid, (2 to 10 inches thick).
Subsoil:	7-35"	Brown, very gravelly loam, friable, medium acid, (10 to 35 inches thick).
Substrata:	35"+	Fractured metamorphic bedrock.
Representative Profile:	Site is located on the 3.0 road in the NE¼, SE¼, Sec. 10, T. 31 S., R. 8 W.	

Variations: Depth to bedrock ranges from 20 to 40 inches. Coarse fragment content ranges from 35 to 75 percent. Surface soil colors are very dark brown, dark brown, or very dark grayish brown. Subsoil colors are dark brown, brown, dark yellowish brown, or strong brown. Surface textures are silt loam, gravelly silt loam, loam, or gravelly loam. Subsoil textures are very gravelly silt loam, or very gravelly loam.

Setting: The Beekman soils occur on steep to very steep sideslopes of the Klamath Mountains at elevations of 1500 to 3200 feet. Slope gradients range from 35 to 90 percent. The soils formed in colluvium from metamorphic, sedimentary and metavolcanic rocks.

The winters are cool and moist and the summers are warm and dry. Mean annual precipitation ranges from 35 to 60 inches. The mean annual air temperature ranges from 50° to 54° F., the mean January temperature centers on 35° F., and the mean July temperature centers on 68° F. The frost-free period ranges from 160 to 200 days. The native vegetation consists of Douglas-fir, incense cedar and ponderosa pine with an understory of poison oak, hazel and ocean spray on southerly aspects; and of Douglas-fir and incense cedar with an understory of salal and Oregon grape on northerly slopes.

The Beekman soils are associated with soils of the shallow, very gravelly Vermisa series; the deep, very gravelly, loamy Kanid series; the moderately deep, clayey, very gravelly McGinnis series; the deep, clayey Pollard and very gravelly, clayey Tishar series. At higher elevations are the colder Jayar and Skymor soils.

Soil Behavior and Recommendations:

Beekman soils support stands of Douglas-fir and incense cedar. Average site index is 120 for northerly aspects and 115 for southerly aspects for the Dillard Area. Site index is 103 for northerly aspects and 84 for southerly aspects for the South Umpqua Area.

The upper 20 inches of Beekman soils have a low water holding capacity. The high amount of coarse fragments, the loam texture, and the low amount of organic matter blend to produce a water holding capacity that is between 1.0 and 2.0 inches.

The success of bare-root Douglas-fir is moderate on northerly aspects in recent clearcuts. On southerly aspects success is low.

Beekman soils in large clearcuts on south exposures have severe reforestation problems. Each area needs to be looked at closely. Generally, both grasses and low water holding capacity are the main problems, with water holding capacity being the most limiting. In areas where Beekman soils have a low amount of coarse fragments and are on 50 to 60 percent slopes, small clearcuts or strip cuts, and artificial shade (see Figure 27) are recommended. Where the soil contains a high percentage of coarse fragments and is on steep slopes, partial cutting is recommended.

Figure 27. An 8" x 12" fibreboard panel provides shade for newly planted seedling.

Broadcast, hot, slash burning does cause erosion on Beekman soils when they occur on steep southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder to get seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn the steep southerly aspects. Where slash is so dense that it prevents planting the area, spot burning is recommended.

Northerly aspects are not as critical for burning.

Road construction requires ripping and some blasting. The material below the soil is usually highly fractured metasedimentary rocks.

Cut bank stability is high on slopes up to 100 percent. The most common failure is sidecast sluicing out when it is placed on slopes over 80 percent. End hauling is recommended.

Sidecast from Beekman soils on slopes less than 80 percent is normally stable. Sidecast responds well to seeding and mulching. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Rocking roads is necessary for winter hauling.

Most of the Beekman soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Beekman soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Mapping Units:

371-370/W — Beekman very gravelly loam - Kanid gravelly loam association, 10 to 35 percent slopes, predominantly southerly. 2178 acres. Moderately deep Beekman soils make up about 60 percent of the area, and deep Kanid soils make up about 40 percent of the area. The Beekman soils are mostly on narrow ridgetops, on ridge noses, and on interfluves of dissected sideslopes. The Kanid soils are mostly on broad ridgetops and in the drainage ways of dissected slopes. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils. Mingled with the Kanid soils are minor inclusions of the deep, red, clayey Pollard soils; and the clayey-skeletal McGinnis and Tishar soils.

371-370/Wn — Beekman very gravelly loam - Kanid gravelly loam association, 10 to 35 percent slopes, predominantly northerly. 882 acres. Moderately deep Beekman soils make up about 60 percent of the area, and deep Kanid soils make up about 40 percent of the area. The Beekman soils are mostly on narrow ridgetops, ridge noses and interfluves of dissected sideslopes. The Kanid soils are mostly on broad ridgetops and in the drainage ways of dissected sideslopes. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils. Mingled with the Kanid soils are minor inclusions of the deep, red, clayey Pollard soils; and the red, clayey-skeletal McGinnis and Tishar soils.

371-370/X — Beekman very gravelly loam - Kanid gravelly loam association, 35 to 65 percent slopes, predominantly southerly. 5665 acres. Moderately deep Beekman soils make up about 60 percent of the area, and deep Kanid soils make up about 40 percent of the area. The Beekman soils are mostly on narrow ridgetops, ridge noses and interfluves of dissected sideslopes. The Kanid soils are mostly on broad ridgetops and in the drainage ways of dissected sideslopes. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils. Mingled with the Kanid soils are minor inclusions of deep, red, clayey Pollard soils; and the red, clayey-skeletal McGinnis and Tishar soils.

371-370/Xn — Beekman very gravelly loam - Kanid gravelly loam association, 35 to 65 percent slopes, predominantly northerly. 550 acres. Moderately deep Beekman soils make up about 60 percent of the area, and deep Kanid soils make up about 40 percent of the area. The Beekman soils are mostly on narrow ridgetops, ridge

noses, and interfluves of dissected sideslopes. The Kanid soils are mostly on broad ridgetops and in the drainage ways of dissected sideslopes. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils. Mingled with the Kanid soils are minor inclusions of deep, red, clayey Pollard soils; and the red, clayey-skeletal McGinnis and Tishar soils.

371-370/YX Beekman very gravelly loam - Kanid gravelly loam association, 35 to 90 percent slopes, predominantly southerly. 894 acres. Moderately deep Beekman soils make up about 60 percent of the area, and deep Kanid soils make up about 40 percent of the area. The Beekman soils are mostly on narrow ridgetops, ridge noses and interfluves of dissected sideslopes. The Kanid soils are mostly in the drainage ways of dissected sideslopes and on slump benches. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils and rock land. Mingled with the Kanid soils are minor inclusions of deep, red, clayey Pollard soils, and of red, clayey-skeletal McGinnis and Tishar soils.

371-370/Y Beekman very gravelly loam - Kanid gravelly loam association, 65 to 90 percent slopes, predominantly southerly. 2934 acres. Moderately deep Beekman soils make up about 60 percent of the area, and deep Kanid soils make up about 40 percent of the area. The Beekman soils are mostly on narrow ridgetops, ridge noses and interfluves of dissected sideslopes. The Kanid soils are mostly in the drainage ways of dissected sideslopes and on slump benches. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils and rock land. Mingled with the Kanid soils are minor inclusions of deep, red, clayey Pollard soils, and of red, clayey-skeletal McGinnis and Tishar soils.

371-370/Yn Beekman very gravelly loam - Kanid gravelly loam association, 65 to 90 percent slopes, predominantly northerly. 950 acres. Moderately deep Beekman soils make up about 60 percent of the area, and deep Kanid soils make up about 40 percent of the area. The Beekman soils are mostly on narrow ridgetops, ridge noses and interfluves of dissected sideslopes. The Kanid soils are mostly in the drainage ways of dissected sideslopes and on slump benches. Mingled with the Beekman soils are minor inclusions of

shallow Vermisa soils and rock land. Mingled with the Kanid soils are minor inclusions of deep, red, clayey Pollard soils, and of red, clayey-skeletal McGinnis and Tishar soils.

371-370-372/X Beekman very gravelly loam - Kanid gravelly loam - Vermisa very gravelly loam association, 35 to 65 percent slopes predominantly southerly. 1494 acres. Moderately deep Beekman soils make up about 50 percent of the area; deep Kanid soils make up about 30 percent of the area; and shallow Vermisa soils make up about 20 percent of the area. The Beekman soils are mostly on narrow ridgetops, ridge noses, and on interfluves of dissected sideslopes. The Kanid soils are mostly on broad ridgetops, slump benches and in drainage ways of dissected sideslopes. The Vermisa soils are mostly on slump escarpments and on headwalls and very steep sideslopes adjacent to streams that are actively downcutting. Mingled with the Beekman and Kanid soils are minor inclusions of deep, red, clayey Pollard soils; and of red, clayey-skeletal McGinnis and Tishar soils. Mingled with the Vermisa soils are minor inclusions of rock land.

371-370-372/XY Beekman very gravelly loam - Kanid gravelly loam - Vermisa very gravelly loam association, 35 to 90 percent slopes, predominantly southerly. 1635 acres. Moderately deep Beekman soils make up about 50 percent of the area, deep Kanid soils make up about 30 percent of the area, and shallow Vermisa soils make up about 20 percent of the area. The Beekman soils are mostly on narrow ridgetops, ridge noses, and on interfluves of dissected sideslopes. The Kanid soils are mostly on broad ridgetops, slump benches, and in drainage ways of dissected sideslopes. The Vermisa soils are mostly on slump escarpments and on headwalls and very steep sideslopes adjacent to streams that are actively downcutting. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Beekman and Kanid soils are minor inclusions of deep, red, clayey Pollard soils; and of red, clayey-skeletal McGinnis and Tishar soils. Mingled with the Vermisa soils are minor inclusions of rock land.

371-370-372/XYn Beekman very gravelly loam - Kanid gravelly loam - Vermisa very gravelly loam association, 35 to 90 percent slopes, predominantly northerly. 2996 acres. Moderately deep Beekman soils make up about 50 percent of the area, deep Kanid soils make up about 30 percent of the area, and shallow Vermisa soils make up about 20 percent of the area. The Beekman soils are mostly on narrow ridgetops, ridge noses, and on interfluves of dissected sideslopes. The Kanid soils are mostly on broad ridgetops, slump benches, and in drainage ways of dissected sideslopes. The Vermisa soils are mostly on slump escarpments and on headwalls and very steep sideslopes adjacent to streams that are actively downcutting. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Beekman and Kanid soils are minor inclusions of deep, red, clayey Pollard soils; and of red, clayey-skeletal McGinnis and Tishar soils. Mingled with the Vermisa soils are minor inclusions of rock land.

371-370-381/X Beekman very gravelly loam - Kanid gravelly loam - McGinnis very gravelly clay loam association, 35 to 65 percent slopes, predominantly southerly. 5604 acres. Moderately deep loamy skeletal Beekman soils make up about 50 percent of the area. Deep Kanid soils make up about 30 percent of the area. Moderately deep, red, clayey-skeletal McGinnis soils make up about 20 percent of the area. The Beekman soils are mostly on smooth sideslopes and interfluves of dissected sideslopes. The Kanid soils are mostly in drainage ways of dissected sideslopes and on slump benches. The McGinnis soils are mostly on ridgetops and ridge noses. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils. Mingled with the Kanid and McGinnis soils are minor inclusions of deep, red, loamy-skeletal Tishar soils and deep, red, clayey Pollard soils.

371-370-381/Y Beekman very gravelly loam - Kanid gravelly loam - McGinnis very gravelly clay loam association, 65 to 90 percent slopes, predominantly southerly. 2194 acres. Moderately deep, loamy-skeletal Beekman soils make up about 50 percent of the area. Deep Kanid soils make up about 30 percent of the area. Moderately deep, red, clayey-skeletal McGinnis soils make up about 20 percent of the area. The Beekman soils are mostly on smooth sideslopes and interfluves of dissected sideslopes. The Kanid soils are mostly in drainage ways of dissected sideslopes and on slump

benches. The McGinnis soils are mostly on ridgetops and ridgenoses. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils. Mingled with the Kanid and McGinnis soils are minor inclusions of deep, red, loamy-skeletal Tishar soils and deep, red, clayey Pollard soils.

371-372/X — Beekman very gravelly loam - Vermisa very gravelly loam association, 35 to 65 percent slopes, predominantly southerly. 2080 acres. Moderately deep Beekman soils make up about 70 percent of the area, and shallow Vermisa soils make up about 30 percent of the area. The Beekman soils are mostly on benches of uneven slopes and on toe slopes. The Vermisa soils are mostly on escarpments of uneven slopes, and on the headwalls of drainage ways. Mingled with the Beekman soils are minor inclusions of deep Kanid soils in drainage ways of dissected slopes and on slump benches, and of the clayey-skeletal McGinnis and Tishar soils on ridgetops and ridge noses. Mingled with the Vermisa soils are minor inclusions of rock land.

371-372/Yn — Beekman very gravelly loam - Vermisa very gravelly loam association, 35 to 65 percent slopes, predominantly northerly. 1587 acres. Moderately deep Beekman soils make up about 70 percent of the area, and shallow Vermisa soils make up about 30 percent of the area. The Beekman soils are mostly on benches of uneven slopes and on toe slopes. The Vermisa soils are mostly on escarpments of uneven slopes, and on the headwalls of drainage ways. Mingled with the Beekman soils are minor inclusions of deep Kanid soils in drainage ways of dissected slopes and on slump benches and of the clayey-skeletal McGinnis and Tishar soils on ridgetops and ridge noses. Mingled with the Vermisa soils are minor inclusions of rock land.

371-372/XY — Beekman very gravelly loam - Vermisa very gravelly loam association, 35 to 90 percent slopes. 2048 acres. Moderately deep Beekman soils make up about 70 percent of the area, and shallow Vermisa soils make up about 30 percent of the area. The Beekman soils are mostly on narrow ridgetops and interfluves of dissected sideslopes. The Vermisa soils are mostly on slump escarpments and on headwalls. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Beekman soils are minor inclusions of the clayey-skeletal McGinnis soils and the deep, loamy-skeletal Kanid soils. Mingled with the Vermisa soils are minor inclusions of rock land.

371-372/Y Beekman very gravelly loam - Vermisa very gravelly loam association, 56 to 90 percent slopes, predominantly southerly. 20,620 acres. Moderately deep Beekman soils make up about 70 percent of the area, and shallow Vermisa soils make up about 30 percent of the area. The Beekman soils are mostly on benches of uneven slopes, and on toe slopes. The Vermisa soils are mostly on escarpments of uneven slopes and on the headwalls of drainage ways. Mingled with the Beekman soils are minor inclusions of deep Kanid soils in drainage ways of dissected slopes and on slump benches, and of the clayey-skeletal McGinnis and Tishar soils on ridgetops and ridge noses. Mingled with the Vermisa soils are minor inclusions of rock land.

371-372/Yn Beekman very gravelly loam - Vermisa very gravelly loam association, 65 to 90 percent slopes, predominantly northerly. 9012 acres. Moderately deep Beekman soils make up about 70 percent of the area, and shallow Vermisa soils make up about 30 percent of the area. The Beekman soils are mostly on benches of uneven slopes and on toe slopes. The Vermisa soils are mostly on escarpments of uneven slopes, and on the headwalls of drainage ways. Mingled with the Beekman soils are minor inclusions of deep Kanid soils in drainage ways of dissected slopes and on slump benches, and of the clayey-skeletal McGinnis and Tishar soils on ridgetops and ridge noses. Mingled with the Vermisa soils are minor inclusions of rock land.

371-372-370/XY Beekman very gravelly loam - Vermisa very gravelly loam - Kanid gravelly loam association, 35 to 90 percent slopes, predominantly southerly. 813 acres. Moderately deep Beekman soils make up about 50 percent of the area, shallow Vermisa soils make up about 30 percent of the area, and deep Kanid soils make up about 20 percent of the area. The Beekman soils are mostly on narrow ridgetops and interfluves of dissected sideslopes. The Vermisa soils are mostly on slump escarpments and on headwalls. The Kanid soils are mostly on slump benches and in drainage ways of dissected slopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Beekman soils are minor inclusions of the clayey-skeletal McGinnis soils. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Kanid soils are minor inclusions of the clayey-skeletal Tishar soils and the clayey Pollard soils.

371-372-370/XYn Beekman very gravelly loam - Vermisa very gravelly loam - Kanid gravelly loam association, 35 to 90 percent slopes, predominantly northerly. 894 acres. Moderately deep Beekman soils make up about 50 percent of the area, shallow Vermisa soils make up about 30 percent of the area, and deep Kanid soils make up about 20 percent of the area. The Beekman soils are mostly on narrow ridgetops and interfluves of dissected sideslopes. The Vermisa soils are mostly on slump escarpments and on headwalls. The Kanid soils are mostly on slump benches and in drainage ways of dissected slopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Beekman soils are minor inclusions of the clayey-skeletal McGinnis soils. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Kanid soils are minor inclusions of the clayey-skeletal Tishar soils and the clayey Pollard soils.

371-372-381/XY Beekman very gravelly loam - Vermisa very gravelly loam - McGinnis very gravelly clay loam association, 35 to 90 percent slopes, predominantly southerly. 343 acres. Moderately deep, loamy-skeletal Beekman soils make up about 50 percent of the area, shallow Vermisa soils make up about 30 percent of the area, and moderately deep, clayey-skeletal McGinnis soils make up about 20 percent of the area. The Beekman soils are mostly on interfluves of dissected sideslopes and on slump benches. The Vermisa soils are mostly on slump escarpments and on headwalls. The McGinnis soils are mostly on ridge noses, ridgetops, and old slump benches. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Beekman soils are minor inclusions of Kanid soils. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the McGinnis soils are minor inclusions of Tishar and Pollard soils.

371-372-382/W Beekman very gravelly loam - Vermisa very gravelly loam - Tishar gravelly silty clay loam association, 10 to 35 percent slopes, predominantly southerly. 160 acres. Moderately deep Beekman soils make up about 50 percent of the area; shallow Vermisa soils make up about 30 percent of the area; and deep, clayey-skeletal Tishar soils make up about 20 percent of the area. The Beekman soils are mostly on interfluves of dissected slopes and on slump benches.

The Vermisa soils are mostly on slump escarpments and on headwalls. The Tishar soils are mostly on ridgetops and ridge noses. Mingled with the Beekman soils are minor inclusions of Kanid soils. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Tishar soils are minor inclusions of moderately deep, clayey-skeletal McGinnis soils, and deep, clayey Pollard soils.

371-372-382/XWn Beekman very gravelly loam - Vermisa very gravelly loam - Tishar gravelly silty clay loam association, 10 to 65 percent slopes, predominantly northerly. 4497 acres. Moderately deep Beekman soils make up about 50 percent of the area, shallow Vermisa soils make up about 30 percent of the area, and deep clayey-skeletal Tishar soils make up about 20 percent of the area. The Beekman soils are mostly on interfluves of dissected slopes and on slump benches. The Vermisa soils are mostly on slump escarpments and on headwalls. The Tishar soils are mostly on ridgetops and ridge noses. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Beekman soils are minor inclusions of Kanid soils. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Tishar soils are minor inclusions of moderately deep, clayey-skeletal McGinnis soils, and deep, clayey Pollard soils.

371-372-382/X Beekman very gravelly loam - Vermisa very gravelly loam - Tishar gravelly silty clay loam association, 35 to 65 percent slopes, predominantly southerly. 4782 acres. Moderately deep Beekman soils make up about 50 percent of the area; shallow Vermisa soils make up about 30 percent of the area, and deep, clayey-skeletal Tishar soils make up about 20 percent of the area. The Beekman soils are mostly on interfluves of dissected slopes and on slump benches. The Vermisa soils are mostly on slump escarpments and on headwalls. The Tishar soils are mostly on ridgetops and ridge noses. Mingled with the Beekman soils are minor inclusions of Kanid soils. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Tishar soils are minor inclusions of moderately deep, clayey-skeletal McGinnis soils, and deep, clayey Pollard soils.

371-372-382/YXn Beekman very gravelly loam - Vermisa very gravelly loam - Tishar gravelly silty clay loam association, 35 to 90 percent slopes, predominantly northerly. 1422 acres. Moderately deep Beekman soils make up about 50 percent of the area, shallow Vermisa soils make up about 30 percent of the area, and deep, clayey-skeletal Tishar soils make up about 20 percent of the area. The Beekman soils are mostly on interfluves of dissected slopes and on slump benches. The Vermisa soils are mostly on slump escarpments and on headwalls. The Tishar soils are mostly on ridgetops and ridge noses. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Beekman soils are minor inclusions of Kanid soils. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Tishar soils are minor inclusions of moderately deep, clayey-skeletal McGinnis soils, and deep, clayey Pollard soils.

371-381/X Beekman very gravelly loam - McGinnis very gravelly clay loam association, 35 to 65 percent slopes, predominantly southerly. 4209 acres. Moderately deep, loamy-skeletal Beekman soils make up about 70 percent of the area, and moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area. The Beekman soils are mostly on the steeper sideslopes. The McGinnis soils are mostly on ridgetops, ridge noses, and old slump benches. Mingled with the Beekman soils are minor inclusions of deep Kanid soils in drainage ways of dissected slopes, and of shallow Vermisa soils on slump escarpments and headwalls. Mingled with the McGinnis soils are minor inclusions of the deep Tishar soils and the red, clayey Pollard soils.

371-381/Xn Beekman very gravelly loam - McGinnis very gravelly clay loam association, 35 to 65 percent slopes, predominantly northerly. 2518 acres. Moderately deep, loamy-skeletal Beekman soils make up about 70 percent of the area; and moderately deep, clayey-skeletal McGinnis rock make up about 30 percent of the area. The Beekman soils are mostly on the steeper sideslopes. The McGinnis soils are mostly on ridgetops, ridge noses, and old slump benches. Mingled with the Beekman soils are minor inclusions of deep Kanid soils in drainage ways of dissected slopes, and of shallow Vermisa soils on slump escarpments and headwalls. Mingled with the McGinnis soils are minor inclusions of the deep Tishar soils and the red, clayey Pollard soils.

371-381/Y Beekman very gravelly loam - McGinnis very gravelly clay loam association, 65 to 90 percent slopes, predominantly southerly. 929 acres. Moderately deep, loamy-skeletal Beekman soils make up about 70 percent of the area; and moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area. The Beekman soils are mostly on the steeper sideslopes. The McGinnis soils are mostly on ridgetops, ridge noses and old slump benches. Mingled with the Beekman soils are minor inclusions of deep Kanid soils in drainage ways of dissected slopes, and of shallow Vermisa soils on slump escarpments and headwalls. Mingled with the McGinnis soils are minor inclusions of the deep Tishar soils and the red, clayey Pollard soils.

371-382-372/YXn Beekman very gravelly loam - Tishar gravelly silty clay loam - Vermisa very gravelly loam association, 35 to 90 percent slopes, predominantly northerly. 1540 acres. Moderately deep Beekman soils make up about 50 percent of the area; deep, clayey-skeletal Tishar soils make up about 30 percent of the area; and shallow Vermisa soils make up about 20 percent of the area. The Beekman soils are mostly on interfluves of dissected slopes and on slump benches. The Vermisa soils are mostly on slump escarpments and on headwalls. The Tishar soils are mostly on ridgetops and ridge noses. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Beekman soils are minor inclusions of Kanid soils. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Tishar soils are minor inclusions of moderately deep, clayey-skeletal McGinnis soils, and deep, clayey Pollard soils.

VERMISA SERIES (372)

The Vermisa series consists of shallow, very gravelly, well-drained soils from sedimentary and metamorphic rocks in areas receiving 35 to 60 inches of precipitation. They occur on steep to very steep slopes in the Klamath Mountains at elevations of 600 to 3200 feet.

Profile Description: Vermisa very gravelly loam

Surface Soil:	0-4"	Dark yellowish brown, very gravelly loam, friable, slightly acid, (2 to 6 inches thick).
Subsoil:	4-18"	Brown, very gravelly, clay loam, friable, moderately acid, (6 to 18 inches thick).
Substrata:	18"+	Fractured metamorphic rock.
Representative Profile:	The site is located on the 15.0 road near its junction with the 3.0 road in the SW¼, NE¼, Sec. 15, T. 31 S., R. 8 W.	

Variations: Depth to bedrock ranges from 10 to 20 inches. Coarse fragment content ranges from 35 to 75 percent. Surface soil colors are dark brown, brown, or dark yellowish brown. Subsoil colors are yellowish brown, strong brown, brown or reddish brown. Textures of the surface and subsoil layers are very gravelly loam or very gravelly clay loam.

Setting: The Vermisa soils occur on steep to very steep mountainous slopes at elevations of 600 to 3200 feet. Slope gradients range from 35 to 90 percent with most areas being steeper than 50 percent. The soils formed in colluvium from metamorphic, sedimentary and metavolcanic rocks.

The summers are warm and dry and the winters are cool and moist. Mean annual precipitation ranges from 35 to 60 inches. The mean annual air temperature ranges from 47° to 52° F., the mean January temperature centers on 35° F., and the mean July temperature centers on 68° F. The frost-free period ranges from 160 to 200 days. Vegetation consists of Douglas-fir, ponderosa pine, madrone, incense cedar, tanoak and canyon live oak with an understory of poison oak, hazel and ocean spray. Figure 28 shows the shallowness of Vermisa soils and a typical stand of canyon live oak and Douglas-fir.

The Vermisa soils are associated with the moderately deep, very gravelly Beekman soils; the deep, very gravelly Kanid soils; and rock land.

Soil Behavior and Recommendations:

Vermisa soils support stands of scattered Douglas-fir and canyon live oak. Average site index is 80 for northerly aspects and 80 for southerly aspects.

The soil has a low water holding capacity. The high amount of coarse fragments, the loam texture, and the low amount of organic matter produces a water holding capacity that is between 0.5 and 1.5. This amount of moisture is not adequate for survival of bare-root Douglas-fir in clearcuts. These soils are very difficult to reforest. Clearcutting is not recommended for any aspect.

On southerly aspects, much effort and money has to be spent to reforest these soils. On northerly aspects, regeneration is still difficult but not as expensive.

The stand density on these soils is below normal (see Figure 29). The water holding capacity is not enough to support normally stocked stands. The production of these soils is accordingly low.

Recommendations are:

1. For steep southerly aspects with high coarse fragment content, remove them from the allowable cut base.

2. For northerly aspects and gentler southerly aspects with low coarse fragment content, use partial cutting on narrow strip cuts.

3. Identify the acres of these soils and reduce the volume per acre that normal yield tables say will be produced. Frequently these soils produce about 60 percent of normal production.

Most of the Vermisa soils occur on slopes too steep for tractor logging. Cable logging is recommended.

Vermisa soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Broadcast, hot, slash burning does cause erosion on Vermisa soils when they occur on 70 percent southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder to get seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn these soils.

Figure 28. A typical canyon live oak - Douglas-fir stand on a southerly aspect growing on Vermisa soil. Microsites that support canyon live oak are considered incapable of growing a Douglas-fir. The number of Douglas-fir growing on Vermisa is likely to stay the same regardless of whether canyon live oak is present or not.

Figure 29. A fully stocked stand of Douglas-fir on Vermisa soils northerly aspect. Contrast the density shown here with the density shown in Figure 17. Vermisa soils are not capable of producing a "normal" stand.

Burning slash does not produce a significant increase in erosion on northerly aspects. Recommendation is to spot burn where possible.

Road construction requires mostly blasting. The material below the soil is usually hard to moderately hard metasedimentary rock.

Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out on sideslopes with gradients over 80 percent.

Sidecast from Vermisa soil on slopes less than 80 percent is normally stable. Sidecast does not respond well to seeding and mulching. There are very few fines. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Mapping Units:

372-371/X — Vermisa very gravelly loam - Beekman very gravelly loam association, 35 to 65 percent slopes, predominantly southerly. 444 acres. Shallow Vermisa soils make up 60 percent of the area, and moderately deep Beekman soils make up about 40 percent of the area. The Vermisa soils are mostly on very steep headwalls and on the interfluves of dissected sideslopes. The Beekman soils are mostly in drainage ways of dissected slopes and on slump benches. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Beekman soils are minor inclusions of deep, loamy-skeletal Kanid soils in drainage ways and on slump benches; and clayey-skeletal McGinnis and Tishar soils on ridgetops and ridge noses.

372-372/YX — Vermisa very gravelly loam - Beekman very gravelly loam association, 35 to 90 percent slopes, predominantly southerly. 729 acres. Shallow Vermisa soils make up 60 percent of the area and moderately deep Beekman soils make up about 40 percent of the area. The Vermisa soils are mostly on very steep headwalls and on the interfluves of dissected sideslopes. The Beekman soils are mostly in drainage ways of dissected slopes and on slump benches. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Beekman soils are minor inclusions of deep, loamy-skeletal Kanid soils in drainage ways and on slump benches; and clayey-skeletal McGinnis and Tishar soils on ridgetops and ridge noses.

372-371/Y — Vermisa very gravelly loam - Beekman very gravelly loam association, 65 to 90 percent slopes, predominantly southerly. 31,922 acres. Shallow Vermisa soils make up 60 percent of the area, and moderately deep Beekman soils make up 40 percent of the area. The Vermisa soils are mostly on very steep headwalls and on the interfluves of dissected sideslopes. The Beekman soils are mostly in drainage ways of dissected slopes and on slump benches. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Beekman soils are minor inclusions of deep, loamy-skeletal Kanid soils in drainage ways and on slump benches; and clayey-skeletal McGinnis and Tishar soils on ridgetops and ridge noses.

372-371/Yn — Vermisa very gravelly loam - Beekman very gravelly loam association, 56 to 90 percent slopes, predominantly northerly. 9636 acres. Shallow Vermisa soils make up 60 percent of the area, and moderately deep Beekman soils make up about 40 percent of the area. The Vermisa soils are mostly on very steep headwalls and on the inverfluves of dissected sideslopes. The Beekman soils are mostly in drainage ways of dissected slopes and on slump benches. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the Beekman soils are minor inclusions of deep, loamy-skeletal Kanid soils in drainage ways and on slump benches; and clayey-skeletal McGinnis and Tishar soils on ridgetops and ridge noses.

372-371-R/Y — Vermisa very gravelly loam - Beekman very gravelly loam - Rock land association, 65 to 90 percent slopes, predominantly southerly, 18,895 acres. Shallow Vermisa soils make up about 50 percent of the area; moderately deep Beekman soils make up about 30 percent of the area; and rock land makes up about 20 percent of the area. The Vermisa soils and rock land are mostly on very steep headwalls and slump escarpments. The Beekman soils are mostly on slump benches and in drainage ways of dissected sideslopes. Mingled with the Beekman soils are minor inclusions of deep Kanid soils, and clayey-skeletal McGinnis and Tishar soils.

372-371-R/Yn — Vermisa very gravelly loam - Beekman very gravelly loam - Rock land association, 65 to 90 percent slopes, predominantly northerly. 5148 acres. Shallow Vermisa soils make up about 50 percent of the area, moderately deep Beekman soils make up about 30 percent of the area, and rock land makes up about 20 percent of the area. The Vermisa soils and rock land are mostly on very steep headwalls and slump escarpments. The Beekman soils are mostly on slump benches and in drainage ways of dissected sideslopes. Mingled with the Beekman soils are minor inclusions of deep Kanid soils; and clayey-skeletal McGinnis and Tishar soils.

372-381/X — Vermisa very gravelly loam - McGinnis very gravelly loam association, 35 to 65 percent slopes, predominantly southerly. 124 acres. Shallow Vermisa soils make up 60 percent of the area, and moderately deep McGinnis soils make up about 40 percent of the area. The Vermisa soils are mostly on very steep headwalls and on the interfluves of dissected sideslopes. The McGinnis soils are mostly on ridgetops and ridge noses and on slump benches. Mingled with the Vermisa soils are minor inclusions of rock land. Mingled with the McGinnis soils are minor inclusions of moderately deep, loamy-skeletal Beekman soils in drainage ways and on slump benches; and clayey-skeletal Tishar soils on ridgetops and ridge noses.

372-R/Y — Vermisa very gravelly loam - Rock land association, 65 to 90 percent slopes, predominantly southerly. 1733 acres. Shallow Vermisa soils make up about 70 percent of the area, and rock land makes up about 30 percent of the area. These soils are on very steep headwalls and sharp crests of mountains. Mingled with the Vermisa soils are minor inclusions of the deeper Beekman and Kanid soils. Mingled with the rock land are significant areas of rock outcrop.

POLLARD SERIES (380)

The Pollard series consists of deep, red, clayey, well-drained soils from metamorphic and sedimentary rocks in areas receiving from 35 to 60 inches of precipitation. They occur on moderately sloping to very steep slopes in the Klamath Mountains at elevations of 600 to 3200 feet.

Profile Description: Pollard silty clay loam

Surface Soil:	0-9"	Dark brown silty clay loam, friable, slightly acid, (6 to 15 inches thick).
Subsoil:	9-55"	Yellowish red clay, firm, very sticky, very plastic, medium acid, (25 to 50 inches thick).
Substrata:	55"+	Fractured metamorphic bedrock.
Representative Profile:	The site is on the 32-7-6.0 road in the SW¼, SE¼, Sec. 29, T. 31 S., R. 7 W.	

Variations: Depth to bedrock ranges from 40 to 60+ inches. Coarse fragment content ranges from 5 to 35 percent. Surface colors are dusky red, very dusky red, dark reddish brown, or very dark brown. Subsoil colors are dark reddish brown, dark red, red, reddish brown, or yellowish red. Surface soil textures are loam, gravelly loam, clay loam, or gravelly clay loam. Subsoil textures are clay, gravelly clay, or heavy clay loam.

Setting: The Pollard soils occur on moderately steep to very steep slopes in the Klamath Mountains at elevations of 600 to 3200 feet. Gradients range from 10 to 85 percent. The soils formed in colluvium from metamorphic, sedimentary and volcanic rocks.

The summers are warm and dry and the winters are cool and moist. Mean annual precipitation ranges from 35 to 50 inches. The mean annual air temperature ranges from 48° to 54° F., the mean January temperature centers on 35° F., and the mean July temperature centers on 68° F. The frost-free period ranges from 160 to 200 days. Vegetation consists of Douglas-fir, ponderosa pine, madrone chinquapin and an associated understory of poison oak, ocean spray and grasses.

The Pollard soils are associated with soils of the very gravelly clayey Tishar series; the moderately deep, very gravelly clayey McGinnis series; the deep, loamy, very gravelly Kanid series; and the moderately deep, loamy very gravelly Beekman series. Adjacent areas underlain by granite rocks have soils of the Siskiyou, Holland and Lettia series.

Soil Behavior and Recommendations:

Pollard soils support productive stands of Douglas-fir with sugar pine, ponderosa pine and incense cedar. The average site index is 140 for northerly aspects and 115 for southerly aspects in the Dillard Area, and 117 for northerly aspects and 100 for southerly aspects in the South Umpqua Area. The stand density is usually normal for Douglas-fir.

Clearcutting is the recommended harvesting practice for Pollard soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. A typical, three-year old, untreated clearcut on Pollard soils is shown in Figure 30. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 3 years following planting. Units should be planted the first winter following logging. This practice helps the trees to become established before the unit is invaded with pioneering vegetation.

Pollard soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Pollard soils provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Pollard soils have a high water holding capacity. The low amount of coarse fragments, the clay loam or loam texture of the surface soil plus the clay texture of the upper part of the subsoil, and the moderate amount of organic matter content all blend to produce a water holding capacity that is between 4.0 and 5.0 inches. This amount of moisture is adequate for the establishment of Douglas-fir in clearcuts. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading is not needed on Pollard soils.

Figure 30. Grasses, forbs, and brush are strong invaders in new clearcuts on Pollard soils. Control of these invaders is necessary for seedling establishment. Partial cutting is not recommended for this soil because control of invading vegetation is not feasible through a canopy of the partial cut.

Burning slash does not produce a significant increase in erosion on Pollard soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendation is to spot burn wherever possible.

Pollard soils support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in Pollard soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Pollard soils. The material below the soil is usually, soft, highly weathered sediments. Cut bank stability is high on slopes less than 45 percent and low on slopes over 45 percent. The most common failures are large blocks of soil slumping above the road when cuts are made in pockets of Pollard soil on slopes over 45 to 60 percent. Where Pollard occurs over conglomerate cut banks and fills are very unstable. Recommend rip rapping cut banks and the toe of large fills.

Pollard soils commonly occur on gentle, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This placement prevents cutting into the toe of the slump, a move that would reduce its support. If a road must be built through the toe of a rotational slump and the back slopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Pollard soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Pollard soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Pollard soils are well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 10 inches of compacted subsoil is adequate.

Fire trails done by hand have the least impact on the soil. If tractors must be used, build closely spaced water bars.

Mapping Units:

380-381/V — Pollard silty clay loam - McGinnis very gravelly clay loam association, 0 to 10 percent slopes. 1992 acres. Deep Pollard soils make up about 70 percent of the area, and moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses. The McGinnis soils are mostly on the steeper sideslopes. Mingled with the Pollard soils are minor inclusions of deep clayey-skeletal Tishar soils. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Beekman and Kanid soils.

380-381/W — Pollard silty clay loam - McGinnis very gravelly clay loam association, 10 to 35 percent slopes, predominantly southerly. 6200 acres. Deep Pollard soils make up about 70 percent of the area, and moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses. The McGinnis soils are mostly on the steeper sideslopes. Mingled with the Pollard soils are minor inclusions of deep clayey-skeletal Tishar soils. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Beekman and Kanid soils.

380-381/Wn — Pollard silty clay loam - McGinnis very gravelly clay loam association, 10 to 35 percent slopes, predominantly northerly. 4414 acres. Deep Pollard soils make up about 70 percent of the area, and moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses. The McGinnis soils are mostly on the steeper sideslopes. Mingled with the Pollard soils are minor inclusions of deep, clayey-skeletal Tishar soils. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Beekman and Kanid soils.

380-381/XW — Pollard silty clay loam - McGinnis very gravelly clay loam association, 10 to 65 percent slopes, predominantly southerly. 1646 acres. Deep Pollard soils make up about 70 percent of the area, and moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses.

The McGinnis soils are mostly on the steeper sideslopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Pollard soils are minor inclusions of deep, clayey-skeletal Tishar soils. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Beekman and Kanid soils.

380-381/X Pollard silty clay loam - McGinnis very gravelly clay loam association, 35 to 65 percent slopes, predominantly southerly. 2085 acres. Deep Pollard soils make up about 70 percent of the area, and moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses. The McGinnis soils are mostly on the steeper sideslopes. Mingled with the Pollard soils are minor inclusions of deep, clayey-skeletal Tishar soils. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Beekman and Kanid soils.

380-381/Xn Pollard silty clay loam - McGinnis very gravelly loam association, 35 to 65 percent slopes, predominantly northerly. 178 acres. Deep Pollard soils make up about 70 percent of the area, and moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses. The McGinnis soils are mostly on the steeper sideslopes. Mingled with the Pollard soils are minor inclusions of deep clayey-skeletal Tishar soils. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Beekman and Kanid soils.

380-381-371/XW Pollard silty clay loam - McGinnis very gravelly clay loam - Beekman very gravelly loam association, 10 to 65 percent slopes, predominantly southerly. 6405 acres. Deep Pollard soils make up about 50 percent of the area; moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area; and moderately deep, loamy-skeletal Beekman soils make up about 20 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses. The McGinnis soils are mostly on the steeper sideslopes. The Beekman soils are mostly on interfluves of dissected sideslopes and on slump benches. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent.

Mingled with the Pollard soils are minor inclusions of deep, clayey-skeletal Tishar soils. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Kanid soils. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils.

380-381-371/XWn Pollard silty clay loam - McGinnis very gravelly clay loam - Beekman very gravelly loam association, 10 to 65 percent slopes, predominantly northerly. 4470 acres. Deep Pollard soils make up about 50 percent of the area; moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area; and moderately deep, loamy-skeletal Beekman soils make up about 20 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses. The McGinnis soils are mostly on the steeper sideslopes. The Beekman soils are mostly on interfluves of dissected sideslopes and on slump benches. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Pollard soils are minor inclusions of deep, clayey-skeletal Tishar soils. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Kanid soils. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils.

380-381-371/Xn Pollard silty clay loam - McGinnis very gravelly clay loam - Beekman very gravelly loam association, 35 to 65 percent slopes, predominantly northerly. 4620 acres. Deep Pollard soils make up about 50 percent of the area; moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area; and moderately deep, loamy-skeletal Beekman soils make up about 20 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses. The McGinnis soils are mostly on the steeper sideslopes. The Beekman soils are mostly on interfluves of dissected sideslopes and on slump benches. Mingled with the Pollard soils are minor inclusions of deep, clayey-skeletal Tishar soils. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Kanid soils. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils.

380-381-371/XY Pollard silty clay loam - McGinnis very gravelly loam - Beekman very gravelly loam association, 35 to 90 percent slopes, predominantly southerly. 368 acres. Deep Pollard soils make up about 50 percent of the area; moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area; and moderately deep, loamy-skeletal Beekman soils make up about 20 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses. The McGinnis soils are mostly on the steeper sideslopes. The Beekman soils are mostly on interfluves of dissected sideslopes and on slump benches. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Pollard soils are minor inclusions of deep, clayey-skeletal Tishar soils. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Kanid soils. Mingled with the Beekman soils are minor inclusions of shallow Vermisa soils.

380-382/WXn Pollard silty clay loam - Tishar gravelly silty clay loam association, 10 to 65 percent slopes, predominantly northerly. 469 acres. Deep Pollard soils make up about 70 percent of the area; and deep, clayey-skeletal Tishar soils make up about 30 percent of the area. The Pollard soils are mostly on broad rounded ridgetops and ridge noses. The Tishar soils are mostly on the steeper sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Pollard soils are minor inclusions of clayey-skeletal McGinnis soils. Mingled with the Tishar soils are minor inclusions of loamy-skeletal Beekman and Kanid soils.

380-395/V Pollard silty clay loam - Renhaven loam association, 0 to 10 percent slopes. 2271 acres. Deep, clayey Pollard soils make up about 70 percent of the area; and deep, brown, fine-loamy Renhaven soils make up about 30 percent of the area. The Pollard soils are mostly on broad, rounded ridgetops and ridge noses. The Renhaven soils are mostly on the steeper sideslopes. Mingled with the Pollard soils are minor inclusions of the deep clayey-skeletal Tishar soils. Mingled with the Renhaven soils are inclusions of the moderately deep, clayey-skeletal McGinnis soils.

380-395/WV — Pollard silty clay loam - Renhaven loam association, 0 to 35 percent slopes. 1287 acres. Deep, clayey Pollard soils make up about 70 percent of the area; and deep, brown, fine-loamy Renhaven soils make up about 30 percent of the area. The Pollard soils are mostly on broad, rounded ridgetops and ridge noses. The Renhaven soils are mostly on the steeper sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 0 and 10 percent. Mingled with the Pollard soils are minor inclusions of the deep, clayey-skeletal Tishar soils. Mingled with the Renhaven soils are inclusions of the moderately deep, clayey-skeletal McGinnis soils.

380-395/WVn — Pollard silty clay loam - Renhaven loam association, 0 to 35 percent slopes, predominantly northerly. 1693 acres. Deep, clayey Pollard soils make up about 70 percent of the area; and deep, brown, fine-loamy Renhaven soils make up about 30 percent of the area. The Pollard soils are mostly on broad, rounded ridgetops and ridge noses. The Renhaven soils are mostly on the steeper sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 0 and 10 percent. Mingled with the Pollard soils are minor inclusions of the deep, clayey-skeletal Tishar soils. Mingled with the Renhaven soils are inclusions of the moderately deep, clayey-skeletal McGinnis soils.

380-395/W — Pollard silty clay loam - Renhaven loam association, 10 to 35 percent slopes, predominantly southerly. 6520 acres. Deep, clayey Pollard soils make up about 70 percent of the area; and deep, brown, fine-loamy Renhaven soils make up about 30 percent of the area. The Pollard soils are mostly on broad, rounded ridgetops and ridge noses. The Renhaven soils are mostly on the steeper sideslopes. Mingled with the Pollard soils are minor inclusions of the deep, clayey-skeletal Tishar soils. Mingled with the Renhaven soils are inclusions of the moderately deep, clayey-skeletal McGinnis soils.

McGINNIS SERIES (381)

The McGinnis series consists of moderately deep, red, clayey, very gravelly, well-drained soils from metamorphic and sedimentary rocks in areas receiving from 35 to 60 inches of precipitation. They occur on moderately steep to very steep slopes in the Klamath Mountains at elevations of 600 to 3200 feet.

Profile Description: McGinnis very gravelly clay loam.

Surface Soil:	0-7"	Dark reddish brown, very gravelly clay loam, friable, slightly acid, (6 to 14 inches thick).
Subsoil:	7-34"	Yellowish red, very gravelly clay, firm, sticky, plastic, medium acid, (10 to 34 inches thick).
Substrata:	34"+	Fractured metamorphic rocks.

Representative Profile: The site is located on the 29.2 road near its junction with the 9.0 road in the NW¼, SE¼, Sec. 9, T. 30 S., R. 8 W.

Variations: Depth to bedrock ranges from 20 to 40 inches. Coarse fragment content ranges from 35 to 75 percent. Surface colors are dusky red, dark reddish brown, or very dark brown. Subsoil colors are dark reddish brown, dark red, red, reddish brown, or yellowish red. Surface soil textures are gravelly loam, gravelly clay loam, very gravelly loam, or very gravelly clay loam. Subsoil textures are very gravelly clay or very cobbly clay.

Setting: The McGinnis soils occur on moderately steep to very steep slopes in the Klamath Mountains at elevations of 600 to 3200 feet. Gradients range from 10 to 90 percent, with slopes over 35 percent being most common. The soils formed in colluvium from metamorphic, sedimentary and volcanic rocks. The summers are warm and dry and the winters are cool and moist. Mean annual precipitation ranges from 35 to 60 inches. The mean annual air temperature ranges from 48° to 54° F., the mean January temperature centers on 35° F., the mean July temperature centers on 68° F. The frost-free period is 160 to 200 days. Vegetation consists of Douglas-fir, ponderosa pine, madrone, chinquapin and an associated understory of posion oak, ocean spray, hazel and grasses.

The McGinnis soils are associated with soils of the deep, very gravelly Tishar series; the deep, clayey Pollard series; the deep, loamy, very gravelly Kanid series; the moderately deep, loamy, very gravelly Beekman series; and the shallow, loamy, very gravelly Vermisa series. Adjacent areas of soils from granitoid rocks have soils of the Siskiyou and Holland and Lettia series.

Soil Behavior and Recommendations:

McGinnis soils support productive stands of Douglas-fir with ponderosa pine, sugar pine and incense cedar. The average site index is 140 for northerly aspects and 115 for southerly aspects in the Dillard Area, and 117 for northerly aspects and 100 for southerly aspects in the South Umpqua Area.

Clearcutting is the recommended harvesting practice for McGinnis soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects as shown in Figure 31. However, on southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 3 years following planting. Units should be planted the first winter following logging. This practice helps get the trees established before the unit is invaded with pioneering vegetation.

McGinnis soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on the soil. However, tractor logging is an acceptable method of yarding on McGinnis soils provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of McGinnis soils have a high water holding capacity. The low amount of coarse fragments, the clay loam or loam texture of the surface soil plus the clay texture of the upper part of the subsoil and the moderate amount of organic matter content all blend to produce a water holding capacity that is between 2.0 and 3.0 inches. This amount of moisture is adequate for the establishment of Douglas-fir in clearcuts. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be moderate. Shading is not needed on McGinnis soils.

Figure 31. A young vigorous stand of Douglas-fir that is common on McGinnis soil on northerly aspects. Scattered amounts of madrone and manzanita are common on McGinnis soils.

Road construction is generally easy in McGinnis soils. The material below the soil is usually soft, highly weathered sediments. Cut bank stability is high on slopes less than 45 percent and low on slopes over 45 percent. The most common failures are small half-moon shaped pieces of the cut bank slipping into the road.

Sidecast from McGinnis soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in McGinnis soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Burning slash does not produce a significant increase in erosion on McGinnis soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendation is to spot burn wherever possible.

McGinnis soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snow brush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in McGinnis soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period, the brush can be sprayed with a herbicide to favor Douglas-fir.

McGinnis soils are moderately well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 12 inches of compacted subsoil is adequate. When deep cuts are made in McGinnis to create a pond, normally the bottom will be highly fractured and porous. In this situation a sealer made from the subsoil is recommended.

Fire trails built by hand have the least impact on the soil. If tractors must be used, build closely spaced water bars.

Mapping Units:

381-380/XY	McGinnis very gravelly clay loam - Pollard silty clay loam association, 35 to 90 percent slopes, predominantly southerly. 1670 acres. Moderately deep, clayey-skeletal McGinnis soils make up about 60 percent of the area; and deep, red, clayey Pollard

soils make up about 40 percent of the area. The McGinnis soils are mostly on the narrow ridgetops and on interfluves of dissected sideslopes. The Pollard soils are mostly on slump benches, smooth sideslopes and in saddles on the ridgetops. About 70 percent of the slopes have gradients between 35 and 65 percent and about 30 percent have gradients between 65 and 90 percent. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Beekman and Kanid soils. Mingled with the Pollard soils are minor inclusions of clayey-skeletal Tishar soils.

381-382/X McGinnis very gravelly clay loam - Tishar gravelly silty clay loam association, 35 to 65 percent slopes, predominantly southerly. 160 acres. Moderately deep, clayey-skeletal McGinnis soils make up about 60 percent of the area; and deep, red, clayey-skeletal Tishar soils make up about 40 percent of the area. The McGinnis soils are mostly on the narrow ridgetops and on interfluves of dissected sideslopes. The Tishar soils are mostly on slump benches, and smooth sideslopes. Mingled with the McGinnis soils are minor inclusions of loamy-skeletal Beekman and Kanid soils. Mingled with the Tishar soils are minor inclusions of clayey Pollard soils.

TISHAR SERIES (382)

The Tishar series consists of deep, red, clayey, very gravelly well-drained soils from metamorphic and sedimentary rocks in areas receiving from 35 to 60 inches of precipitation. They occur on strongly sloping to very steep slopes in the Klamath Mountains at elevations of 600 to 3200 feet.

Profile Description: Tishar gravelly silty clay loam

Surface Soil:	0-9"	Dark reddish brown, gravelly silty clay loam, friable, slightly acid, (5 to 15 inches thick).
Subsoil:	9-48"	Yellowish red, very gravelly clay loam, firm, very sticky, very plastic, medium acid, (25 to 59 inches thick).
Substrata:	48"+	Fractured metamorphic rocks.

Representative Profile: The site is located along the 19.0 road near its junction with the 9.0 road in the SE¼, SE¼, Sec. 5, T. 31 S., R. 8 W.

Variations: Depth to bedrock ranges from 40 to 60+ inches. Coarse fragment content ranges from 35 to 75 percent. Surface colors are dusky red, dark reddish brown, or very dark brown. Subsoil colors are dark reddish brown, dark red, red, reddish brown, or yellowish red. Surface soil textures are gravelly loam, gravelly clay loam, very gravelly loam, or very gravelly silty clay loam. Subsoil textures are very gravelly clay, or very cobbly clay.

Setting: The Tishar soils occur on strongly sloping to very steep slopes in the Klamath Mountains at elevations of 600 to 3200 feet. Gradients range from 10 to 90 percent, with slopes of 10 to 65 percent being most common. The soils formed in colluvium from metamorphic, sedimentary and volcanic rocks. The summers are warm and dry and the winters are cool and moist. Mean annual precipitation ranges from 35 to 80 inches. The mean annual air temperature ranges from 48° to 54° F., the mean January temperature centers on 35° F., and the mean July temperature centers on 68° F. The frost-free period is 160 to 200 days. Vegetation consists of Douglas-fir, ponderosa pine, chinquapin, madrone and an associated understory of poison oak, ocean spray, hazel and grasses.

The Tishar soils are associated with soils of the deep, clayey Pollard series; the moderately deep, clayey, very gravelly McGinnis series; the deep, loamy, very gravelly Kanid series; and the moderately deep, loamy, very gravelly Beekman series. Adjacent areas underlain by granitoid rocks have soils of the Siskiyou and Holland and Lettia series.

Soil Behavior and Recommendations:

Tishar soils support productive stands of Douglas-fir with sugar pine, ponderosa pine and incense cedar. The average site index is 117 for northerly aspects and 100 for southerly aspects. The stand density is usually normal for Douglas-fir.

Clearcutting is the recommended harvesting practice for Tishar soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species competes with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 3 years following planting. Units should be planted the first winter following logging. This practice helps the trees to become established before the unit is invaded by pioneering vegetation.

Tishar soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Tishar soils provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Tishar soils have a high water holding capacity. The 20 to 40 percent coarse fragments, the silty clay loam texture of the surface soil plus the gravelly clay texture of the upper part of the subsoil, and the moderate amount of organic matter content all blend together to produce a water holding capacity that is between 2.0 and 3.0 inches. This amount of moisture is adequate for the survival of Douglas-fir in a clearcut. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading is not needed on Tishar soils.

Burning slash does not produce a significant increase in erosion on Tishar soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendation is to spot burn wherever possible.

Tishar soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in Tishar soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Tishar soils. The material below the soil is usually soft, highly weathered sediments. Cut bank stability is high on slopes less than 45 percent and low on slopes over 45 percent. The most common failures are large blocks of soil slumping into the road when cuts are made in pockets of Tishar soil on slopes over 45 to 60 percent. When Tishar occurs over conglomerate, cut banks and fills are very unstable. Recommend rip rapping cut banks and toes of large fills in areas of conglomerate.

Tishar soils commonly occur on gentle, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the back slopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Tishar soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Tishar soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Tishar soils are moderately well suited for helipond locations and poorly suited as fill for small earth dams. The soil contains a high percentage of coarse fragments which can cause leaks in the bottom of a pond. The coarse fragments are very difficult to remove to make a suitable fill material.

Heliponds located in Tishar need a sealer for the bottom. Usually there is a nearby area of Pollard soil that is well suited as a sealer. Most of the time 6 inches of compacted red clay from Pollard provides an adequate seal.

Fire trail construction done by hand has the least impact on the soil. If tractors must be used, build closely spaced water bars.

Mapping Units:

382-381/WV — Tishar gravelly silty clay loam - McGinnis very gravelly clay loam association, 0 to 35 percent slopes, predominantly southerly. 1373 acres. Deep Tishar soils make up about 60 percent of the area, and moderately deep McGinnis soils make up about 40 percent of the area. The Tishar soils are mostly on broad ridgetops and on slump benches. The McGinnis soils are mostly on narrow ridgetops and dissected sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 0 and 10 percent. Mingled with the Tishar soils are minor inclusions of clayey Pollard soils. Mingled with the McGinnis soils are minor inclusions of the loamy-skeletal Beekman and Kanid soils.

382-381/W — Tishar gravelly silty clay loam - McGinnis very gravelly clay loam association, 10 to 35 percent slopes, predominantly southerly. 13,698 acres. Deep Tishar soils make up about 60 percent of the area, and moderately deep McGinnis soils make up about 40 percent of the area. The Tishar soils are mostly on broad ridgetops and on slump benches. The McGinnis soils are mostly on narrow ridgetops and dissected sideslopes. Mingled with the Tishar soils are minor inclusions of clayey Pollard soils. Mingled with the McGinnis soils are minor inclusions of the loamy-skeletal Beekman and Kanid soils.

382-381/Wn — Tishar gravelly silty clay loam - McGinnis very gravelly clay loam assocation, 10 to 35 percent slopes, predominantly northerly. 4591 acres. Deep Tishar soils make up about 60 percent of the area, and moderately deep McGinnis soils make up about 40 percent of the area. The Tishar soils are mostly on broad ridgetops and on slump benches. The McGinnis soils are mostly on narrow ridgetops and dissected sideslopes. Mingled with the Tishar soils are minor inclusions of clayey Pollard soils. Mingled with the McGinnis soils are minor inclusions of the loamy-skeletal Beekman and Kanid soils.

382-381/X — Tishar gravelly silty clay loam - McGinnis very gravelly clay loam association, 35 to 65 percent slopes, predominantly southerly. 9041 acres. Deep Tishar soils make up about 60 percent of the area, and moderately deep McGinnis soils make up about 40 percent of the area. The Tishar soils are mostly on broad ridgetops and on slump benches. The McGinnis soils are mostly on narrow ridgetops and dissected sideslopes. Mingled with the Tishar soils are minor inclusions of clayey Pollard soils. Mingled with the McGinnis soils are minor inclusions of the loamy-skeletal Beekman and Kanid soils.

382-381/Xn — Tishar gravelly silty clay loam - McGinnis very gravelly clay loam association, 35 to 65 percent slopes, predominantly northerly. 4150 acres. Deep Tishar soils make up about 60 percent of the area, and moderately deep McGinnis soils make up about 40 percent of the area. The Tishar soils are mostly on broad ridgetops and on slump benches. The McGinnis soils are mostly on narrow ridgetops and dissected sideslopes. Mingled with the Tishar soils are minor inclusions of clayey Pollard soils. Mingled with the McGinnis soils are minor inclusions of the loamy-skeletal Beekman and Kanid soils.

382-381-371/VW — Tishar gravelly silty clay loam - McGinnis very gravelly clay loam - Beekman very gravelly loam association, 0 to 35 percent slopes, predominantly southerly. 1353 acres. Deep Tishar soils make up about 50 percent of the area; moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area; and moderately deep, loamy-skeletal Beekman soils make up about 20 percent. The Tishar soils are mostly on broad ridgetops and smooth sideslopes. The McGinnis soils are mostly on the interfluves of dissected slopes and on narrow ridgetops. The Beekman soils are mostly in drainage ways of dissected slopes, and on recent slumps. About 70 percent of the slopes have gradients between 0 and 10 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Tishar soils are minor inclusions of Pollard soils. Mingled with the McGinnis and Beekman soils are minor inclusions of Kanid soils.

382-381-371/X Tishar gravelly silty clay loam - McGinnis very gravelly clay loam - Beekman very gravelly loam association, 35 to 65 percent slopes, predominantly southerly. 2883 acres. Deep Tishar soils make up about 50 percent of the area; moderately deep, clayey-skeletal McGinnis soils make up about 30 percent of the area; and moderately deep, loamy-skeletal Beekman soils make up about 20 percent. The Tishar soils are mostly on broad ridgetops and smooth sideslopes. The McGinnis soils are mostly on the interfluves of dissected slopes and on narrow ridgetops. The Beekman soils are mostly in drainage ways of dissected slopes and on recent slumps. Mingled with the Tishar soils are minor inclusions of Pollard soils. Mingled with the McGinnis and Beekman soils are minor inclusions of Kanid soils.

LARMINE SERIES (393)

The Larmine series consists of shallow, brown, loamy-skeletal soils formed in colluvium from sedimentary rocks in areas receiving from 30 to 50 inches of precipitation. They occur on headwalls and very steep sideslopes in the Coast Range at elevations of 800 to 2600 feet.

Profile Description: Larmine gravelly loam

Surface Soil:	0-3"	Dark grayish brown, gravelly loam, friable, slightly acid, (2 to 6 inches thick).
Subsoil:	3-19"	Yellowish brown, very gravelly loam, friable, medium acid, (5 to 12 inches thick).
Substrata:	19"+	Hard, slightly fractured sandstone.
Representative Profile:	NE¼, NE¼, Sec. 24, T. 25 S., R. 7 W., on 25-7-29 road 1/8 mile south of the junction with the 25-7-30.1 road.	

Variations: Depth to hard bedrock ranges from 10 to 20 inches. Rock fragment content ranges from 35 to 85 percent. The color of the surface layer is dark grayish brown, grayish brown, dark brown or brown. The texture of the surface layer is gravelly loam, very gravelly loam, or very gravelly silt loam. The color of the subsoil is yellowish brown, dark yellowish brown, or brown. The texture of the subsoil is very gravelly loam or very gravelly silt loam.

Setting: Larmine soils are on very narrow ridgetops, very steep sideslopes and headwalls in the Coast Range at elevations of 800 to 2800 feet. The soils developed in gravelly medium-textured colluvium from sandstone and siltstone. The climate has cool, moist winters and dry, warm summers. Average annual precipitation ranges from 35 to 50 inches. The soils are dry between depths of 4 and 12 inches for more than 45 days during the dry season. The mean annual temperature is about 50° to 55° F., mean January temperature is about 39° F., and the mean July temperature is about 66° F. The frost-free season is 160 to 210 days. The native vegetation has a canopy of Douglas-fir and incense cedar, with an understory of hazel, poison oak, ocean spray and grasses.

Larmine soils are associated with the moderately deep, loamy-skeletal Atring soils; the deep, fine-loamy Renhaven soils; the deep, red, clayey Bateman soils; and the moderately deep, clayey Bellpine soils.

Soil Behavior and Recommendations:

Larmine soils support stands of scattered Douglas-fir and incense cedar. Average site index is 89 for northerly aspects and 102 for southerly aspects. The Larmine soils were underlain by hard bedrock on the northerly slopes, and by soft bedrock on the southerly slopes, where the site index measurements were made.

The soil has a low water holding capacity. The high amount of coarse fragments, the loam texture, and the low amount of organic matter produce a water holding capacity that is between 0.8 and 1.5 inches. This amount of moisture is not adequate for survival of Douglas-fir seedlings in clearcuts on southerly aspects. Not only is the water holding capacity low; grass invades clearcuts.

For northerly aspects, survival of Douglar-fir bare-root seedlings is moderate.

These soils do not produce the normal amount of volume.

Larmine soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Recommendations are:

1. For steep southerly aspects with high coarse fragment content, remove them from the allowable cut base.

2. For northerly aspects, use partial cuts, narrow strip cuts or small clearcuts.

3. For gentle southerly aspects where coarse fragment content is low and the bedrock is soft and fractured, partial cutting or narrow strip cuts with artificial shade is recommended.

4. Identify the acres of these soils and reduce the volume per acre that normal yield tables say will be produced. Frequently these soils produce about 60 percent of normal.

Broadcast, hot, slash burning does cause erosion on Larmine soils when they occur on 70 percent southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder to get seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn these soils.

Burning slash does not produce a significant increase in erosion on northerly aspects. Recommendation is to spot burn where possible.

Road construction requires ripping and blasting. The material below the soil is usually hard and moderately hard sandstone. Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out.

Road construction can cause severe erosion on Larmine soils when they are on sideslopes over 80 percent or in draws with slopes over 75 percent. When sidecast becomes saturated, it overloads the soil below it and triggers large debris avalanches. Recommendations are:

1. Avoid building roads in these soils.

2. If roads must be built, then roll the grade, keep them narrow, and end haul. Local experience has shown that doing these items substantially reduced debris avalanches. Particular attention needs to be given to the way the pioneer road is constructed. In very steep segments no pioneer is recommended. In other areas where a pioneer road can be used a small cat with a U-shaped blade is recommended. Figure 32 shows a berm that is helpful to prevent sidecast from being lost over the side.

Sidecast from Larmine soil on slopes less than 80 percent is normally stable. Sidecast does not respond well to seeding and mulching. There are very few fines. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Mapping Units:

393-394/X — Larmine gravelly loam - Atring gravelly loam association, 35 to 65 percent slopes. 951 acres. Shallow Larmine soils make up about 65 percent of the area, and moderately deep Atring soils make up about 35 percent of the area. The Larmine soils are mostly on very steep headwalls and slump escarpments. The Atring soils are on slump benches and the interfluves of dissected sideslopes. Mingled with the Larmine soils are minor inclusions of rock land and rock outcrop. Mingled with the Atring soils are minor inclusions of fine-loamy Renhaven soils.

393-394/XY — Larmine gravelly loam - Atring gravelly loam association, 35 to 90 percent slopes. 703 acres. Shallow Larmine soils make up about 65 percent of the area, and moderately deep Atring soils make up about 35 percent of the area. The Larmine soils are mostly on very steep headwalls and slump escarpments.

Figure 32. The large berm to the right prevents material from being lost over the side while the road is being taken down to grade. The berm is pulled into the road with a front-end loader.

The Atring soils are on slump benches and on the interfluves of dissected sideslopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Larmine soils are minor inclusions of rock land and rock outcrop. Mingled with the Atring soils are minor inclusions of fine-loamy Renhaven soils.

393-394/YX — Larmine gravelly loam - Atring gravelly loam association, 35 to 90 percent slopes. 213 acres. Shallow Larmine soils make up about 65 percent of the area, and moderately deep Atring soils make up about 35 percent of the area. The Larmine soils are mostly on very steep headwalls and slump escarpments. The Atring soils are on slump benches and the interfluves of dissected sideslopes. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Larmine soils are minor inclusions of rock land and rock outcrop. Mingled with the Atring soils are minor inclusions of fine-loamy Renhaven soils.

393-394/Y — Larmine gravelly loam - Atring gravelly loam association, 65 to 90 percent slopes. 9128 acres. Shallow Larmine soils make up about 65 percent of the area and moderately deep Atring soils make up about 35 percent of the area. The Larmine soils are mostly on very steep headwalls and slump escarpments. The Atring soils are on slump benches and the interfluves of dissected sideslopes. Mingled with the Larmine soils are minor inclusions of rock land and rock outcrop. Mingled with the Atring soils are minor inclusions of fine-loamy Renhaven soils.

393-394-395/XY — Larmine gravelly loam - Atring gravelly loam - Renhaven loam association, 35 to 90 percent slopes. 416 acres. Shallow Larmine soils make up about 50 percent of the area; moderately deep Atring soils make up about 30 percent of the area; and deep, loamy Renhaven soils make up about 20 percent of the area. The Larmine soils are mostly on very steep headwalls and slump escarpments. The Atring soils are mostly on narrow ridgetops and on interfluves of steep dissected sideslopes. The Renhaven soils are mostly on broad ridgetops and slump benches. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Larmine soils are minor inclusions of rock land. Mingled with the Atring and Renhaven soils are minor inclusions of Bateman soils.

393-394-395/Y Larmine gravelly loam - Atring gravelly loam - Renhaven loam association, 65 to 90 percent slopes. 1712 acres. Shallow Larmine soils make up about 50 percent of the area; moderately deep Atring soils make up about 30 percent of the area; and deep, loamy Renhaven soils make up about 20 percent of the area. The Larmine soils are mostly on very steep headwalls and slump escarpments. The Atring soils are mostly on narrow ridgetops and on interfluves of steep dissected sideslopes. The Renhaven soils are mostly on broad ridgetops and slump benches. Mingled with the Larmine soils are minor inclusions of rock land. Mingled with the Atring and Renhaven soils are minor inclusions of Bateman soils.

393-394-R/Y Larmine gravelly loam - Atring gravelly loam - Rock land association, 65 to 90 percent slopes. 11,389 acres. Shallow Larmine soils make up about 50 percent of the area; moderately deep Atring soils make up about 30 percent of the area; and rock land makes up about 20 percent of the area. The Larmine soils and rock land are mostly on very steep headwalls and slump escarpments. The Atring soils are mostly on slump benches and on interfluves of dissected sideslopes. Mingled with the Atring soils are minor inclusions of fine-loamy Renhaven soils.

393-396/Y Larmine gravelly loam - Bateman silt loam association, 65 to 90 percent slopes. 227 acres. Shallow, loamy-skeletal Larmine soils make up about 65 percent of the area; and deep, clayey Bateman soils make up about 35 percent of the area. The Larmine soils are mostly on very steep sideslopes and headwalls of drainage ways. The Bateman soils are mostly on narrow slump benches and on ridge noses. Mingled with the Larmine soils are minor inclusions of moderately deep Atring soils. Mingled with the Bateman soils are minor inclusions of the deep, fine-loamy Renhaven soils.

ATRING SERIES (394)

The Atring series consists of moderately deep, brown, loamy-skeletal soils formed in colluvium from sedimentary rocks in areas receiving from 30 to 50 inches of precipitation. They occur on steep and very steep slopes in the Coast Range at elevations of 800 to 2600 feet.

Profile Description: Atring gravelly loam

Surface Soil:	0-9"	Dark grayish brown, gravelly loam, very friable, slightly acid, (6 to 10 inches thick.)
Subsoil:	9-35"	Yellowish brown, very gravelly loam, friable, medium acid (10 to 34 inches thick).
Substrata:	35"+	Hard, slightly fractured sandstone.

Representative Profile: NW¼, SE¼, Sec. 1, T. 25 S., R. 7 W., on road 25-7-19.1, ½ mile west of its junction with 25-7-1.2.

Variations: Depth to hard bedrock ranges from 20 to 40 inches. Rock fragment content ranges from 35 to 85 percent. The color of the surface layer is dark grayish brown, grayish brown, dark brown or brown. The texture of the surface layer is gravelly loam, very gravelly loam or very gravelly silt loam. The color of the subsoil is yellowish brown, dark yellowish brown, or brown. The texture of the subsoil is very gravelly loam or very gravelly silt loam.

Setting: Atring soils are on narrow ridgetops, steep and very steep sideslopes and headwalls in the Coast Range at elevations of 800 to 2800 feet. They are located adjacent to the small interior valleys north of Roseburg (see Figure 33). The soils developed in gravelly medium-textured colluvium from sandstone and siltstone. The climate has cool, moist winters and dry, warm summers. Average annual precipitation ranges from 35 to 50 inches. The soils are dry between depths of 4 and 12 inches for more than 45 days during the dry season. The mean annual temperature is 50° to 55° F., mean January temperature is about 39° F., and the mean July temperature is about 66° F. The frost-free season is 160 to 210 days. The native vegetation has a canopy of Douglas-fir and incense cedar with an understory of hazel, poison oak, salal, Oregon grape and grasses.

Figure 33. Atring soils are found adjacent to small interior valleys such as the one around Umpqua shown here. It is found on the 50 to 70 percent forested slopes.

Atring soils are associated with the shallow Larmine soils; the deep, fine-loamy Renhaven soils; the deep, red, clayey Bateman soils; and the moderately deep, clayey Bellpine soils.

Soil Behavior and Recommendations:

Atring soils support stands of Douglas-fir with incense cedar and grand fir. Average site index is 136 for northerly aspects and 120 for southerly aspects.

The upper 20 inches of Atring soils have a moderate water holding capacity. The moderate amount of coarse fragments, the loam or silt loam textures, and the moderate amount of organic matter blend to produce a water holding capacity that is between 2.5 and 3.5 inches. This amount of moisture is adequate for survival of Douglas fir bare-root stock on north aspects in clearcuts.

The success of bare-root Douglas-fir is high on northerly aspects in recent clearcuts. On very steep direct south and west aspects grass and other vegetation invade clearcuts. Small clearcuts, strip cuts, or artificial shade plus herbicides are recommended.

Burning slash does not produce a significant increase in erosion on northerly aspects. Losses of inorganic potassium and phosphorous do not appear to be significant. There are substantial losses of nitrogen, organic phosphorous and sulfur through volatilization and runoff. Recommendation is to spot burn where possible.

Road construction requires blasting and ripping. The material below the soil is usually fractured moderately hard sandstone. Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent.

Road construction can cause severe erosion on Atring soils when they are on sideslopes over 80 percent or in draws with slopes over 75 percent. When sidecast becomes saturated it overloads the soil below it and triggers large debris avalanches. Recommendations are:

1. Avoid building roads in these soils.

2. If roads must be built, then roll the grade, keep them narrow, and end haul. Local experience has shown that doing these items substantially reduced debris avalanches. Particular attention needs to be given to the way the pioneer road is constructed. In very steep segments no pioneer is recommended. In other areas where a pioneer road can be used, a small cat with a U-shaped blade is recommended. Figure 32 shows a berm that is helpful to prevent sidecast from being lost over the side.

Selection of disposal sites requires as much care as does the location and construction of the road.

Sidecast from Atring soils on slopes less than 80 percent is normally stable. Sidecast responds well to seeding and mulching. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Rocking roads is necessary for winter hauling.

Most of the Atring soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasional areas of this soil are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Atring soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Mapping Units:

394-393/X — Atring gravelly loam - Larmine gravelly loam association, 35 to 65 percent slopes. 2659 acres. Moderately deep Atring soils make up about 70 percent of the area, and shallow Larmine soils make up about 30 percent of the area. The Atring soils are mostly on the steep sideslopes, narrow ridgetops and interfluves of dissected sideslopes. The Larmine soils are mostly on very steep headwalls and on sharp ridge crests. Mingled with the Atring soils are minor inclusions of fine-loamy Renhaven soils and clayey Bateman soils. Mingled with the Larmine soils are minor inclusions of rock land.

394-393/XY — Atring gravelly loam - Larmine gravelly loam association, 35 to 90 percent slopes. 871 acres. Moderately deep Atring soils make up about 70 percent of the area, and shallow Larmine soils make up about 30 percent of the area. The Atring soils are mostly on the steep sideslopes, narrow ridgetops, and interfluves of dissected sideslopes. The Larmine soils are mostly on very steep headwalls and on sharp ridge crests. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Atring soils are minor inclusions of fine-loamy Renhaven soils and clayey Bateman soils. Mingled with the Larmine soils are minor inclusions of rock land.

394-393/YX — Atring gravelly loam - Larmine gravelly loam association, 35 to 90 percent slopes. 2028 acres. Moderately deep Atring soils make up about 70 percent of the area, and shallow Larmine soils make up about 30 percent of the area. The Atring soils are mostly on the steep sideslopes, narrow ridgetops, and interfluves of dissected sideslopes. The Larmine soils are mostly on very steep headwalls and on sharp ridge crests. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Atring soils are minor inclusions of fine-loamy Renhaven soils and clayey Bateman soils. Mingled with the Larmine soils are minor inclusions of rock land.

394-393/Y Atring gravelly loam - Larmine gravelly loam association, 65 to 90 percent slopes. 8445 acres. Moderately deep Atring soils make up about 70 percent of the area, and shallow Larmine soils make up about 30 percent of the area. The Atring soils are mostly on the steep sideslopes, narrow ridgetops and interfluves of dissected sideslopes. The Larmine soils are mostly on very steep headwalls and on sharp ridge crests. Mingled with the Atring soils are minor inclusions of fine-loamy Renhaven soils and clayey Bateman soils. Mingled with the Larmine soils are minor inclusions of rock land.

394-393-395/X Atring gravelly loam - Larmine gravelly loam - Renhaven loam association, 35 to 65 percent slopes. 789 acres. Moderately deep Atring soils make up about 50 percent of the area; shallow Larmine soils make up about 30 percent of the area; and deep, fine-loamy Renhaven soils make up about 20 percent of the area. The Atring soils are mostly on narrow ridgetops and interfluves of dissected sideslopes. The Larmine soils are mostly on headwalls and on sharp ridge crests. The Renhaven soils are on broad ridgetops, in drainage ways of dissected slopes and on slump benches. Mingled with the Atring and Renhaven soils are minor inclusions of clayey Bateman soils. Mingled with the Larmine soils are minor inclusions of rock land.

394-393-395/XY Atring gravelly loam - Larmine gravelly loam - Renhaven loam association, 35 to 90 percent slopes. 836 acres. Moderately deep Atring soils make up about 50 percent of the area; shallow Larmine soils make up about 30 percent of the area; and deep, fine-loamy Renhaven soils make up about 20 percent of the area. The Atring soils are mostly on narrow ridgetops and interfluves of dissected sideslopes. The Larmine soils are mostly on headwalls and on sharp ridge crests. The Renhaven soils are on broad ridgetops, in drainage ways of dissected slopes and on slump benches. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Atring and Renhaven soils are minor inclusions of clayey Bateman soils. Mingled with the Larmine soils are minor inclusions of rock land.

394-393-395/YX Atring gravelly loam - Larmine gravelly loam - Renhaven loam association, 35 to 90 percent slopes. 1529 acres. Moderately deep Atring soils make up about 50 percent of the area; shallow Larmine soils make up about 30 percent of the area; and deep, fine-loamy Renhaven soils make up about 20 percent of the area. The Atring soils are mostly on narrow ridgetops and interfluves of dissected sideslopes. The Larmine soils are mostly on headwalls and on sharp ridge crests. The Renhaven soils are on broad ridgetops, in drainage ways of dissected slopes and on slump benches. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Atring and Renhaven soils are minor inclusions of clayey Bateman soils. Mingled with the Larmine soils are minor inclusions of rock land.

394-393-395/Y Atring gravelly loam - Larmine gravelly loam - Renhaven loam association, 65 to 90 percent slopes. 637 acres. Moderately deep Atring soils make up about 50 percent of the area; shallow Larmine soils make up about 30 percent of the area; and deep, fine-loamy Renhaven soils make up about 20 percent of the area. The Atring soils are mostly on narrow ridgetops and interfluves of dissected sideslopes. The Larmine soils are mostly on headwalls and on sharp ridge crests. The Rehnaven soils are on broad ridgetops, in drainage ways of dissected slopes and on slump benches. Mingled with the Atring and Renhaven soils are minor inclusions of clayey Bateman soils. Mingled with the Larmine soils are minor inclusions of rock land.

394-393-R/Y Atring gravelly loam - Larmine gravelly loam - Rock land association, 65 to 90 percent slopes. 462 acres. Moderately deep Atring soils make up about 50 percent of the area; shallow Larmine soils make up about 30 percent of the area; and rock land makes up about 20 percent of the area. The Atring soils are mostly on narrow ridgetops and the interfluves of dissected sideslopes. The Larmine soils and rock land are mostly on very steep headwalls, slump escarpments and sharp ridge crests. Mingled with the Atring soils are minor inclusions of fine-loamy Renhaven and clayey Bateman soils. Mingled with the rock land are areas of rock outcrop.

394-395/X — Atring gravelly loam - Renhaven loam association, 35 to 65 percent slopes. 4174 acres. Moderately deep Atring soils make up about 60 percent of the area, and deep, fine-loamy Renhaven soils make up about 40 percent of the area. The Atring soils are mostly on steep and very steep sideslopes. The Renhaven soils are mostly on slump benches and ridgetops. Mingled with the Atring soils are minor inclusions of Larmine soils and rock land. Mingled with the Renhaven soils are minor inclusions of clayey Bateman soils.

394-395/XY — Atring gravelly loam - Renhaven loam association, 35 to 90 percent slopes. 1953 acres. Moderately deep Atring soils make up about 60 percent of the area, and deep, fine-loamy Renhaven soils make up about 40 percent of the area. The Atring soils are mostly on steep and very steep sideslopes. The Renhaven soils are mostly on slump benches and ridgetops. About 70 percent of the slopes have gradients between 35 and 65 percent and about 30 percent have gradients between 65 and 90 percent. Mingled with the Atring soils are minor inclusions of Larmine soils and rock land. Mingled with the Renhaven soils are minor inclusions of clayey Bateman soils.

394-395/YX — Atring gravelly loam - Renhaven loam association, 35 to 90 percent slopes. 1591 acres. Moderately deep Atring soils make up about 60 percent of the area, and deep, fine-loamy Renhaven soils make up about 40 percent of the area. The Atring soils are mostly on steep and very steep sideslopes. The Renhaven soils make up about 40 percent of the area. The Atring soils are mostly on steep and very steep sideslopes. The Renhaven soils are mostly on slump benches and ridgetops. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Atring soils are minor inclusions of Larmine soils and rock land. Mingled with the Renhaven soils are minor inclusions of clayey Bateman soils.

394-395/Y — Atring gravelly loam - Renhaven loam association, 65 to 90 percent slopes. 806 acres. Moderately deep Atring soils make up about 60 percent of the area, and deep, fine-loamy Renhaven soils make up about 40 percent of the area. The Atring soils are mostly on steep and very steep sideslopes. The Renhaven soils are mostly on slump benches and ridgetops. Mingled with the Atring soils are minor inclusions of Larmine soils and rock land. Mingled with the Renhaven soils are minor inclusions of clayey Bateman soils.

394-395-393/X — Atring gravelly loam - Renhaven loam - Larmine gravelly loam association, 35 to 65 percent slopes. 2756 acres. Moderately deep Atring soils make up about 50 percent of the area; deep, fine-loamy Renhaven soils make up about 30 percent of the area; and shallow Larmine soils make up about 20 percent of the area. The Atring soils are mostly on narrow ridgetops and interfluves of dissected sideslopes. The Larmine soils are mostly on headwalls and on sharp ridge crests. The Renhaven soils are on broad ridgetops, in drainage ways of dissected slopes and on slump benches. Mingled with the Atring and Renhaven soils are minor inclusions of clayey Bateman soils. Mingled with the Larmine soils are minor inclusions of rock land.

394-396/X — Atring gravelly loam - Bateman silt loam association, 35 to 65 percent slopes. 107 acres. Moderately deep Atring soils make up about 60 percent of the area, and deep, clayey Bateman soils make up about 40 percent of the area. The Atring soils are mostly on steep and very steep sideslopes. The Bateman soils are mostly on slump benches and ridgetops. Mingled with the Atring soils are minor inclusions of Larmine soils and rock land. Mingled with the Bateman soils are minor inclusions of fine-loamy Renhaven soils.

RENHAVEN SERIES (395)

The Renhaven series consists of deep, brown, fine-loamy soils formed in colluvium from sedimentary rocks in areas receiving from 30 to 50 inches of precipitation. They occur on moderately steep to very steep slopes in the Coast Range at elevations of 800 to 2600 feet.

Profile Description: Renhaven loam

Surface Soil:	0-13"	Brown, loam, very friable, medium acid, (8 to 15 inches thick).
Subsoil:	13-49"	Yellowish brown, loam, friable, medium acid, (30 to 50 inches thick).
Substrata:	49"+	Hard, slightly fractured sandstone.
Representative Profile:	SW¼, NW¼, Sec. 31, T. 24 S., R. 6 W., on road 24-6-29.0 ½ mile from its junction with road 24-6-19.1.	

Variations: Depth to hard bedrock ranges from 40 to 60 inches. Rock fragment content ranges from 5 to 35 percent. The color of the surface layer is dark grayish brown, grayish brown, dark brown, or brown. The texture of the surface layer is loam, silt loam or sandy loam. The color of the subsoil is yellowish brown, dark yellowish brown or brown. The texture of the subsoil is gravelly loam, gravelly silt loam, loam or clay loam.

Setting: Renhaven soils are on ridgetops, steep sideslopes and slump benches in the Coast Range at elevations of 800 to 2800 feet. The soils developed in medium-textured colluvium from sandstone and siltstone. The climate has cool, moist winters and warm, dry summers. Average annual precipitation ranges from 35 to 50 inches. The soils are dry between depths of 4 and 12 inches for more than 45 days during the dry season. The mean annual temperature is 50° to 55° F., mean January temperature is about 39° F., and the mean July temperature is about 66° F. The frost-free season is 160 to 210 days. The native vegetation has a canopy of Douglas-fir and incense cedar with an understory of hazel, poison oak, ocean spray and grasses.

Renhaven soils are associated with soils of the clayey Bateman series; the moderately deep, loamy-skeletal Atring series; the shallow, loamy-skeletal Larmine series; and the moderately deep, clayey Bellpine series.

Soil Behavior and Recommendations:

Renhaven soils support productive stands of Douglas-fir with some incense cedar, grand fir and madrone. The average site index is 136 for northerly aspects and is not available for southerly aspects.

Road construction requires ripping and some blasting in Renhaven soils. The material below the soil is usually soft sandstone or highly fractured weathered, moderately hard sandstone. Cut bank stability is high on slopes of less than 60 percent, medium on slopes of between 60 and 80 percent, and low on slopes of more than 80 percent.

The most common failure is placing sidecast on sideslopes or draws with gradients over 80 percent. The sidecast becomes saturated during winter rains and sluices out. Recommendation is to end haul areas 80 percent or over.

Sidecast from Renhaven soils on slopes less than 60 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Sediment that is produced when these soils are disturbed is silty and tends to settle slowly in runoff water. Recommendations are to seed, mulch, and fertilize new road construction before the winter rains begin.

Rocking roads in Renhaven soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Fire trails built by hand have the least impact on the soil. When tractors are used for this purpose, closely spaced water bars are recommended.

Renhaven soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in Renhaven soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Burning slash does not produce a significant increase in erosion on Renhaven soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendation is to spot burn wherever possible.

The upper 20 inches of Renhaven soils have a high water holding capacity. The low amount of coarse fragments, the loam texture of the surface soil plus the silt loam or loam texture of the upper part of the subsoil, and the high organic matter content all blend to produce a water holding capacity that is between 3.5 and 4.0 inches. This amount of moisture is adequate for the survival of bare-root Douglas-fir seedlings in clearcuts. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading is not needed on Renhaven soils.

Most of the Renhaven soils occur on slopes too steep for tractor logging. Cable logging is the recommended practice. Occassionally there are areas of this soil that are flat enough for tractor yarding. Renhaven soils have a medium clay content and are not as easily compacted as the red clay soils. On areas that have slopes of less than 35 percent, Renhaven soils can safely be tractor logged provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. All major skid trails be water barred.

Clearcutting is the recommended harvesting practice for Renhaven soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 2 years following planting. Units should be planted the first winter following logging. This practice helps the trees become established before the unit is invaded by pioneering vegetation.

Renhaven soils are moderately well suited for helipond locations. When deep cuts are made in this soil, porous material is encountered, which is well-suited for material to construct small earth dams. These soils have enough clay and low enough coarse fragment content to compact well. A sealer of 6 to 10 inches of compacted red clay is recommended for heliponds built in this soil.

Mapping Units:

395-12x/V	Renhaven loam - Jory silty clay loam association, 0 to 10 percent slopes. 1600 acres. Deep fine-loamy Renhaven soils make up about 60 percent of the area, and deep, red, clayey Jory soils make up about 40 percent of the area. These soils occur on gently sloping slump benches near the floor of Camas Valley. The Renhaven soils are on areas of medium-textured landslide material and the Jory soils are on fine-textured landslide material. Minor inclusions of seasonally wet mixed alluvial land occur along drainage ways.

395-12x-371/XW Renhaven loam - Jory silty clay loam - Beekman very gravelly loam association, 10 to 65 percent slopes. 507 acres. Deep, loamy Renhaven soils make up about 45 percent of the area; deep, red, clayey Jory soils make up about 30 percent of the area; and moderately deep, loamy-skeletal Beekman soils make up about 25 percent of the area. The Renhaven soils are mostly on steep slump escarpments. The Jory soils are mostly on slump benches. The Beekman soils are mostly on the steeper slump escarpments with the Renhaven soils. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Jory soils are minor inclusions of Pollard soils. Mingled with the Renhaven and Beekman soils are minor inclusions of deep, loamy-skeletal Kanid soils and of shallow, loamy-skeletal Vermisa soils.

395-380/V Renhaven loam - Pollard silty clay loam association, 0 to 10 percent slopes. 142 acres. Deep, fine-loamy Renhaven soils make up about 60 percent of the area; and deep, red, clayey Pollard soils make up about 40 percent of the area. These soils are on gently sloping slump benches in the foothills east of Camas Valley. The Renhaven soils are on areas of medium textured landslide material, and the Pollard soils are on areas of clayey parent material. Minor inclusions of seasonslly wet mixed alluvial land occur along drainage ways.

395-380-371/XW Renhaven loam - Pollard silty clay loam - Beekman very gravelly loam association, 10 to 65 percent slopes. 11,648 acres. Deep, loamy Renhaven soils make up about 45 percent of the area; deep, red, clayey Pollard soils make up about 30 percent of the area; and moderately deep, loamy-skeletal Beekman soils make up about 25 percent of the area. The Renhaven soils are mostly on steep slump escarpments. The Pollard soils are mostly on slump benches. The Beekman soils are mostly on the steeper slump escarpments with the Renhaven soils. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Pollard soils are minor inclusions of Jory soils. Mingled with the Renhaven and Beekman soils are minor inclusions of deep, loamy-skeletal Kanid soils, and of shallow, loamy-skeletal Vermisa soils.

395-394/WX Renhaven loam - Atring gravelly loam association, 10 to 65 percent slopes. 2275 acres. Deep, fine-loamy Renhaven soils make up about 70 percent of the area; and moderately deep, loamy-skeletal Atring soils make up about 30 percent of the area. The Renhaven soils are mostly on narrow ridgetops, ridge noses, slump benches and in drainage ways of dissected slopes. The Atring soils are mostly on slump escarpments and on interfluves of dissected sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mixed with the Renhaven soils are minor inclusions of red, clayey Bateman soils. Mingled with the Atring soils are minor inclusions of shallow, loamy-skeletal Larmine soils and rock land.

395-394/XW Renhaven loam - Atring gravelly loam association, 10 to 65 percent slopes. 294 acres. Deep, fine-loamy Renhaven soils make up about 70 percent of the area; and moderately deep, loamy-skeletal Atring soils make up about 30 percent of the area. The Renhaven soils are mostly on narrow ridgetops, ridge noses, slump benches and in drainage ways of dissected slopes. The Atring soils are mostly on slump escarpments and on interfluves of dissected sideslopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mixed with the Renhaven soils are minor inclusions of red, clayey Bateman soils. Mingled with the Atring soils are minor inclusions of shallow, loamy-skeletal Larmine soils and rock land.

395-394/X Renhaven loam - Atring gravelly loam association, 35 to 65 percent slopes. 9219 acres. Deep, fine-loamy Renhaven soils make up about 70 percent of the area; and moderately deep, loamy-skeletal Atring soils make up about 30 percent of the area. The Renhaven soils are mostly on narrow ridgetops, ridge noses, slump benches, and in drainage ways of dissected slopes. The Atring soils are mostly on slump escarpments and on interfluves of dissected sideslopes. Mixed with the Renhaven soils are minor inclusions of red, clayey Bateman soils. Mingled with the Atring soils are minor inclusions of shallow, loamy-skeletal Larmine soils and rock land.

395-394/XY — Renhaven loam - Atring gravelly loam association, 35 to 90 percent slopes. 885 acres. Deep, fine-loamy Renhaven soils make up about 70 percent of the area; and moderately deep, loamy-skeletal Atring soils make up about 30 percent of the area. The Renhaven soils are mostly on narrow ridgetops, ridge noses, slump benches, and in drainage ways of dissected slopes. The Atring soils are mostly on slump escarpments and on interfluves of dissected sideslopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mixed with the Renhaven soils are minor inclusions of red, clayey Bateman soils. Mingled with the Atring soils are minor inclusions of shallow, loamy-skeletal Larmine soils and rock land.

395-394/YX — Renhaven loam - Atring gravelly loam association, 35 to 90 percent slopes. 957 acres. Deep, fine-loamy Renhaven soils make up about 70 percent of the area; and moderately deep, loamy-skeletal Atring soils make up about 30 percent of the area. The Renhaven soils are mostly on narrow ridgetops, ridge noses, slump benches, and in drainage ways of dissected slopes. The Atring soils are mostly on slump escarpments and on interfluves of dissected sideslopes. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mixed with the Renhaven soils are minor inclusions of red, clayey Bateman soils. Mingled with the Atring soils are minor inclusions of shallow, loamy-skeletal Larmine soils and rock land.

395-394/Y — Renhaven loam - Atring gravelly loam association, 65 to 90 percent slopes. 601 acres. Deep, fine-loamy Renhaven soils make up about 70 percent of the area; and moderately deep, loamy-skeletal Atring soils make up about 30 percent of the area. The Renhaven soils are mostly on narrow ridgetops, ridge noses, slump benches, and in drainage ways of dissected slopes. Mixed with the Renhaven soils are minor inclusions of red, clayey Bateman soils. Mingled with the Atring soils are minor inclusions of shallow, loamy-skeletal Larmine soils and rock land.

395-394-396/X Renhaven loam - Atring gravelly loam - Bateman silt loam association, 35 to 65 percent slopes. 276 acres. Deep, fine-loamy Renhaven soils make up about 50 percent of the area; moderately deep, loamy-skeletal Atring soils make up about 30 percent of the area; and deep, clayey Bateman soils make up about 20 percent of the area. The Renhaven and Bateman soils are mostly on narrow ridgetops, ridge noses, slump benches, and in drainage ways of dissected slopes. The Atring soils are mostly on slump escarpments and on interfluves of dissected sideslopes. Mingled with the Atring soils are minor inclusions of shallow, loamy-skeletal Larmine soils and rock land.

395-394-396/XY Renhaven loam - Atring gravelly loam - Bateman silt loam association, 35 to 90 percent slopes. 640 acres. Deep, fine-loamy Renhaven soils make up about 50 percent of the area; moderately deep, loamy-skeletal Atring soils make up about 30 percent of the area; and deep, clayey Bateman soils make up about 20 percent of the area. The Renhaven and Bateman soils are mostly on narrow ridgetops, ridge noses, slump benches, and in drainage ways of dissected slopes. The Atring soils are mostly on slump escarpments and on interfluves of dissected sideslopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Atring soils are minor inclusions of shallow, loamy-skeletal Larmine soils and rock land.

395-394-R/X Renhaven loam - Atring gravelly loam - Rock land association, 35 to 65 percent slopes. 740 acres. Deep, fine-loamy Renhaven soils make up about 50 percent of the area; moderately deep, loamy-skeletal Atring soils make up about 30 percent of the area; and rock land makes up about 20 percent of the area. The Renhaven soils are mostly on narrow ridgetops, ridge noses, slump benches, and in drainage ways of dissected slopes. The Atring soils are mostly on slump escarpments and on interfluves of dissected sideslopes. The rock land is mostly on the headwalls of drainage ways. Mixed with the Renhaven soils are minor inclusions of red, clayey Bateman soils. Mingled with the Atring soils and rock land are minor inclusions of shallow, loamy-skeletal Larmine soils.

395-396/WV Renhaven loam - Bateman silt loam association, 0 to 35 percent slopes. 407 acres. Deep, fine-loamy Renhaven soils make up about 60 percent of the area; and deep, red, clayey Bateman soils make up about 40 percent of the area. The Renhaven soils are mostly on narrow ridgetops, steep sideslopes, and slump backslopes. The Bateman soils are mostly on broad, rounded ridgetops, ridge noses, and on slump benches. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 0 and 10 percent. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring soils.

395-396/W Renhaven loam - Bateman silt loam association, 10 to 35 percent slopes. 339 acres. Deep, fine-loamy Renhaven soils make up about 60 percent of the area; and deep, red, clayey Bateman soils make up about 40 percent of the area. The Renhaven soils make up about 40 percent of the area. The Renhaven soils are mostly on narrow ridgetops, steep sideslopes, and slump backslopes. The Bateman soils are mostly on broad, rounded ridgetops, ridge noses, and on slump benches. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring and Larmine soils.

395-396/WX Renhaven loam - Bateman silt loam association, 10 to 65 percent slopes. 3378 acres. Deep, fine-loamy Renhaven soils make up about 60 percent of the area; and deep, red, clayey Bateman soils make up about 40 percent of the area. The Renhaven soils are mostly on narrow ridgetops, steep sideslopes, and slump backslopes. The Bateman soils are mostly on broad, rounded ridgetops, ridge noses, and on slump benches. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring and Larmine soils.

395-396/XW Renhaven loam - Bateman silt loam association, 10 to 65 percent slopes. 484 acres. Deep, fine-loamy Renhaven soils make up about 60 percent of the area; and deep, red, clayey Bateman soils make up about 40 percent of the area. The Renhaven soils are mostly on narrow ridgetops, steep sideslopes, and slump backslopes. The Bateman soils are mostly on broad rounded ridgetops, ridge noses, and on

slump benches. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring and Larmine soils.

395-396/X — Renhaven loam - Bateman silt loam association, 35 to 65 percent slopes. 7186 acres. Deep, fine-loamy Renhaven soils make up about 60 percent of the area; and deep, red clayey Bateman soils make up about 40 percent of the area. The Renhaven soils are mostly on narrow ridgetops, steep sideslopes, and slump backslopes. The Bateman soils are mostly on broad, rounded ridgetops, ridge noses, and on slump benches. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring and Larmine soils.

395-396/XY — Renhaven loam - Bateman silt loam association, 35 to 90 percent slopes. 107 acres. Deep, fine-loamy Renhaven soils make up about 60 percent of the area; and deep, red, clayey Bateman soils make up about 40 percent of the area. The Renhaven soils are mostly on narrow ridgetops, steep sideslopes, and slump backslopes. The Bateman soils are mostly on broad, rounded ridgetops, ridge noses, and on slump benches. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring and Larmine soils, and of rock land.

BATEMAN SERIES (396)

The Bateman series consists of deep, reddish-brown clayey soils formed in colluvium from sedimentary rocks in areas receiving from 35 to 50 inches of precipitation. They occcur on gently sloping to steep slopes in the Coast Range at elevations of 500 to 2600 feet.

Profile Description: Bateman silt loam

Surface Soil:	0-7"	Dark brown, silt loam, very friable, medium acid, (6 to 12 inches thick).
Subsoil:	7-60"	Reddish brown, silty clay, friable, strongly acid, (35 to 60 inches thick).
Substrata:	60"+	Slightly weathered sandstone.
Representative Profile:	NW¼, SE¼, Sec. 36, T. 24 S., R. 7 W., on road 24-7-19.1 ½ mile south of its junction with road 24-7-29.0.	

Variations: Depth to hard bedrock ranges from 40 to 60+ inches. Rock fragment content ranges from 1 to 35 percent. The color of the surface layer is dark yellowish brown, dark brown, or brown. The texture of the surface layer is loam, clay loam, or silt loam. The color of the subsoil is strong brown, reddish brown or yellowish red. The texture of the subsoil is heavy silty clay loam or silty clay.

Setting: Bateman soils are on rounded ridgetops, sideslopes and old slump benches in the Coast Range at elevations of 500 to 2600 feet. The soils developed in colluvium from sandstone and siltstone. The climate has cool, moist winters and dry, warm summers. Average annual precipitation ranges from 35 to 50 inches. The soils are dry between depths of 4 and 12 inches for more than 45 days during the dry season. The mean annual temperature is 50° to 55° F., mean annual January temperature is about 39° F., and the mean July temperature is about 66° F. The frost-free season is 160 to 210 days. The native vegetation has a canopy of Douglas-fir and incense cedar with an understory of hazel, poison oak, salal and grasses.

Bateman soils are associated with deep, fine-loamy Renhaven soils; moderately deep, loamy-skeletal Atring soils; shallow, loamy-skeletal Larmine soils; moderately deep, red, clayey Bellpine soils; and deep, red, clayey, dark surface layered Jory soils.

Soil Behavior and Recommendations (Bateman soils over sediments):

Bateman soils support productive stands of Douglas-fir with some incense cedar and grand fir. The average site index is 135 for northerly aspects and is not available for southerly aspects. The stand density is usually normal for Douglas-fir.

Clearcutting is the recommended harvesting practice for Bateman soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 2 years following planting. Units should be planted the first winter following logging. This helps get the trees established before the unit is invaded with pioneering vegetation.

Bateman soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Bateman soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest time of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Bateman soils have a high water holding capacity. The low amount of coarse fragments, the silty clay loam texture of the surface soil and subsoil, and the moderate amount of organic matter all blend together to produce a water holding capacity that is between 4.0 and 4.5 inches. This amount of moisture is adequate for survival of Douglas-fir in a clearcut. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading is not needed on Bateman soils.

Burning slash does not produce a significant increase in erosion on Bateman soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendation is to spot burn wherever possible.

Bateman soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in Bateman soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Bateman soils. The material below the soil is usually soft, highly weathered sediments. Cut bank stability is high on slopes less than 35 percent and low on slopes over 35 percent. The most common failures are small slumps that fill ditches. Generally, road failures are minimal in Bateman soils.

Bateman soils commonly occur on gently, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the back slopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Batemen soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Bateman soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Bateman soils are well suited for helipond (see Figure 34) locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 10 inches of compacted subsoil is adequate.

Hand built fire trails have the least impact on the soil. If tractors must be used to construct fire trails, then build closely spaced water bars.

Soil Behavior and Recommendations (Bateman soils over tuffs and breccias):

All the statements for Bateman soils over sediments apply to Bateman soils over tuffs and breccias with the following exceptions:

Figure 34. Typical pond built for fire protection, wildlife, water source for processing rock, and recreation. The size of ponds is around one-half acre.

1. Bateman soils over tuffs and breccias contain more expanding type clays than do Bateman soils over sedimentary bedrock. Sediment coming from disturbed areas tends to stay in suspension longer. Recommendation is to rock all new mainline roads. For spur roads either rock them or block them and rip, seed, mulch and fertilize.

2. When these soils are ripped following compaction from tractor logging, the compacted layers break up faster.

3. Extra road rock is needed on new fills made from Bateman soils. Experience has shown that 16 to 24 inches of rock is needed, depending on the quality of rock and the amount of traffic, to hold up log trucks.

Mapping Units:

396/V — Bateman silt loam, 0 to 10 percent slopes. 315 acres. This mapping unit consists predominantly of Bateman soils on broad, rounded ridgetops and smooth sideslopes. Mingled with the Bateman soils are minor inclusions of deep, red, clayey, dark surface layered Jory soils; and of moderately deep, red, clayey Bellpine soils on the gentle slopes; and of fine-loamy Renhaven soils, and loamy-skeletal Atring soils on the steeper sideslopes.

396/VW — Bateman silt loam, 0 to 35 percent slopes. 373 acres. This mapping unit consists predominantly of Bateman soils on broad, rounded ridgetops and smooth sideslopes. About 70 percent of the slopes have gradients between 0 and 10 percent and about 30 percent have gradients between 10 and 35 percent. Mingled with the Bateman soils are minor inclusions of deep, red, clayey, dark surface layered Jory soils; and of moderately deep, red, clayey Bellpine soils on the gentle slopes; and of fine-loamy Renhaven soils, and loamy-skeletal Atring soils on the steeper sideslopes.

396/WV — Bateman silt loam, 0 to 35 percent slopes. 513 acres. This mapping unit consists predominantly of Bateman soils on broad, rounded ridgetops and smooth sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent and about 30 percent have gradients between 0 and 10 percent. Mingled with the Bateman soils are minor inclusions of deep, red, clayey dark surface layered Jory soils; and of moderately deep, red, clayey Bellpine soils on the gentle slopes; and of fine-loamy Renhaven soils, and loamy-skeletal Atring soils on the steeper sideslopes.

396/W — Bateman silt loam, 10 to 35 percent slopes. 1291 acres. This mapping unit consists predominantly of Bateman soils on broad, rounded ridgetops and smooth sideslopes. Mingled with the Bateman soils are minor inclusions of deep, red, clayey, dark, surface layered Jory soils; and of moderately deep, red, clayey Bellpine soils on the gentle slopes; and of fine-loamy Renhaven soils, and loamy-skeletal Atring soils on the steeper sideslopes.

396/X — Bateman silt loam, 35 to 65 percent slopes. 194 acres. This mapping unit consists predominantly of Bateman soils on broad, rounded ridgetops and smooth sideslopes. Mingled with the Bateman soils are minor inclusions of deep, red, clayey, dark surface layered Jory soils, and of moderately deep, red, clayey Bellpine soils on the gentle slopes; and of fine-loamy Renhaven soils, and loamy-skeletal Atring soils on the steeper sideslopes.

396-12/WV — Bateman silt loam - Jory silty clay loam association, 0 to 35 percent slopes. 695 acres. Deep, light surface layered, Bateman soils make up about 60 percent of the area, and deep, dark surface layered Jory soils make up about 40 percent of the area. The Bateman soils are mostly on the steeper sideslopes and slump escarpments. The Jory soils are mostly on broad, rounded ridgetops and old slump benches. About 70 percent of the slopes have gradients between 10 and 35 percent and about 30 percent have gradients between 0 and 10 percent. Mingled with the Bateman soils are minor inclusions of fine-loamy Renhaven soils, and loamy-skeletal Atring soils. Mingled with the Jory soils are minor inclusions of moderately deep, red, clayey Bellpine soils.

396-12/W — Bateman silt loam - Jory silty clay loam association, 10 to 35 percent slopes. 2084 acres. Deep, light surface layered, Bateman soils make up about 60 percent of the area, and deep, dark surface layered Jory soils make up about 40 percent of the area. The Bateman soils are mostly on the steeper sideslopes and slump escarpments. The Jory soils are mostly on broad, rounded ridgetops and old slump benches. Mingled with the Bateman soils are minor inclusions of fine-loamy Renhaven soils, and loamy-skeletal Atring soils. Mingled with the Jory soils are minor inclusions of moderately deep, red, clayey Bellpine soils.

396-12x/WX — Bateman silt loam - Jory silty clay loam association, 10 to 65 percent slopes. 192 acres. Deep, light surface layered Bateman soils make up about 60 percent of the area, and deep, dark surface layered Jory soils make up about 40 percent of the area. The Bateman soils are mostly on the steeper sideslopes and slump escarpments. The Jory soils are mostly on broad, rounded ridgetops, and old slump benches. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Bateman soils are minor inclusions of fine-loamy Renhaven soils and loamy-skeletal Atring soils. Mingled with the Jory soils are minor inclusions of moderately deep, red, clayey Bellpine soils.

396-12x/XW — Bateman silty loam - Jory silty clay loam association, 10 to 65 percent slopes. 684 acres. Deep, light surface layered Bateman soils make up about 60 percent of the area, and deep, dark surface layered Jory soils make up about 40 percent of the area. The Bateman soils are mostly on the steeper sideslopes and slump escarpments. The Jory soils are mostly on broad, rounded ridgetops, and old slump benches. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Bateman soils are minor inclusions of fine-loamy Renhaven soils and loamy-skeletal Atring soils. Mingled with the Jory soils are minor inclusions of moderately deep, red, clayey Bellpine soils.

396-12x/X — Bateman silt loam - Jory silty clay loam association, 35 to 65 percent slopes. 373 acres. Deep, light surface layered Bateman soils make up about 60 percent of the area, and deep, dark surface layered Jory soils make up about 40 percent of the area. The Bateman soils are mostly on the steeper sideslopes and slump escarpments. The Jory soils are mostly on broad, rounded ridgetops and old slump benches. Mingled with the Bateman soils are minor inclusions of fine-loamy Renhaven soils, and loamy-skeletal Atring soils. Mingled with the Jory soils are minor inclusions of moderately deep, red, clayey Bellpine soils.

396-13/W — Bateman silt loam - Bellpine clay loam, 10 to 35 percent slopes. 578 acres. Deep Bateman soils make up about 70 percent of the area, and moderately deep Bellpine soils make up about 30 percent of the area.

The Bateman soils are mostly on rounded ridgetops and ridge noses and moderately sloping slump benches. The Bellpine soils are mostly on the steeper sideslopes and slump escarpments. Mingled with the Bateman soils are minor inclusions of fine-loamy Renhaven soils and dark, surface layered Jory soils. Mingled with the Bellpine soils are minor inclusions of loamy-skeletal Atring soils.

396-13/WX — Bateman silt loam - Bellpine clay loam, 10 to 65 percent slopes. 1818 acres. Deep Bateman soils make up about 70 percent of the area, and moderately deep Bellpine soils make up about 30 percent of the area. The Bateman soils are mostly on rounded ridgetops, ridge noses and moderately sloping slump benches. The Bellpine soils are mostly on the steeper sideslopes and slump escarpments. About 70 percent of the slopes have gradients between 10 and 35 percent and about 30 percent have gradients between 35 and 65 percent. Mingled with the Bateman soils are minor inclusions of fine-loamy Renhaven soils and dark surface layered Jory soils. Mingled with the Bellpine soils are minor inclusions of loamy-skeletal Atring soils.

396-394/XW — Bateman silt loam - Atring gravelly loam association, 10 to 65 percent slopes. 363 acres. Deep, clayey Bateman soils make up about 70 percent of the area, and moderately deep, loamy-skeletal Atring soils make up about 30 percent of the area. The Bateman soils are mostly on broad, rounded ridgetops, ridge noses, and smooth sideslopes. The Atring soils are mostly on dissected sideslopes and narrow ridgetops. About 70 percent of the slopes have gradients between 35 and 65 percent and about 30 percent have gradients between 10 and 35 percent. Mingled with the Bateman soils are minor inclusions of the fine-loamy Renhaven soils. Mingled with the Atring soils are minor inclusions of the shallow Larmine soils.

396-395/W — Bateman silt loam - Renhaven loam association, 10 to 35 percent slopes. 7843 acres. Deep, clayey Bateman soils make up about 60 percent of the area, and deep, fine-loamy Renhaven soils make up about 40 percent of the area. The Bateman soils are mostly on broad rounded ridgetops, ridge noses and smooth sideslopes. The Renhaven soils are mostly on the steeper sideslopes. Mingled with the Bateman soils are minor inclusions of dark surface layered Jory soils. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring soils.

396-395/WX — Bateman silt loam - Renhaven loam association, 10 to 65 percent slopes. 3441 acres. Deep, clayey Bateman soils make up about 60 percent of the area, and deep, fine-loamy Renhaven soils make up about 40 percent of the area. The Bateman soils are mostly on broad rounded ridgetops, ridge noses, and smooth sideslopes. The Renhaven soils are mostly on the steeper sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Bateman soils are minor inclusions of dark surface layered Jory soils. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring soils.

396-395/XW — Bateman silt loam - Renhaven loam association, 10 to 65 percent slopes. 1111 acres. Deep, clayey Bateman soils make up about 60 percent of the area, and deep, fine-loamy Renhaven soils make up about 40 percent of the area. The Bateman soils are mostly on broad rounded ridgetops, ridge noses, and smooth sideslopes. The Renhaven soils are mostly on the steeper sideslopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with the Bateman soils are minor inclusions of dark surface layered Jory soils. Mingled with the Renhaven soils are minor loamy-skeletal Atring soils.

396-395/X — Bateman silt loam - Renhaven loam association, 35 to 65 percent slopes. 3073 acres. Deep, clayey Bateman soils make up about 60 percent of the area, and deep, fine-loamy Renhaven soils make up about 40 percent of the area. The Bateman soils are mostly on broad rounded ridgetops, ridge noses, and smooth sideslopes. The Renhaven soils are mostly on the steeper sideslopes. Mingled with the Bateman soils are minor inclusions of dark surface layered Jory soils. Mingled with the Renhaven soils are minor loamy-skeletal Atring soils.

396-395-12x/W — Bateman silt loam - Renhaven loam - Jory silty clay loam association, 35 to 65 percent slopes. 477 acres. Deep, clayey Bateman soils make up about 40 percent of the area; deep, fine-loamy Renhaven soils make up about 35 percent of the area; and deep, dark colored, clayey Jory soils make up about 25 percent of the area. The Bateman and Jory soils are mostly on broad rounded ridgetops, ridge noses, and smooth sideslopes. The Renhaven soils are mostly on the steeper sideslopes. Mingled with the Renhaven soils are minor inclusions of loamy-skeletal Atring soils.

DARBY SERIES (397)

The Darby series consists of deep, dark brown, clayey soils formed in colluvium from basalt and sedimentary rocks in areas receiving from 30 to 50 inches of precipitation (see Figure 35). They occur on moderately steep to steep slopes in the Cascade Mountains at elevations of 500 to 2700 feet.

Figure 35. A profile of Darby soil. It is free of coarse fragments and has a very clayey subsoil with strong subangular blocky structure.

Profile Description: Darby silty clay loam

Surface Soil:	0-10"	Dark brown, silty clay loam, friable, neutral, (8 to 15 inches thick).
Subsoil:	10-44"	Dark brown, silty clay, firm, neutral, (32 to 50 inches thick).
Substrata:	44"+	Partially weathered basalt.
Representative Profile:	NE¼, SE¼, Sec. 27, T. 25 S., R. 4 W., on road 25-4-26.0 about 200 feet west of its junction with road 25-4-26.1.	

Variations: Depth to weathered bedrock ranges from 40 to more than 60 inches. Rock fragment content ranges from 0 to 10 percent. The color of the surface layer is very dark brown or dark brown. The texture of the surface layer is silty clay loam, clay loam or silty clay. The color of the subsoil is very dark brown or dark brown. The texture of the subsoil is silty clay or clay.

Setting: Darby soils are on gently sloping ridgetops, steep sideslopes and in concave drainage ways in the Cascade Mountains at elevations of 500 to 2700 feet. The soils developed in colluvium from basalt and sedimentary rocks. The winters are cool and moist, and the summers are warm and dry. The soils are dry between depths of 4 and 12 inches for more than 45 days during the summer. The mean annual precipitation ranges from 30 to 50 inches. Mean January temperature is about 40° F., mean July temperature is about 67° F., and mean annual temperature is 52° to 56° F. The frost-free period is about 160 to 210 days. The native vegetation has a canopy of Oregon white oak, black oak and Douglas-fir, and an understory of poison oak, wild iris and grasses.

Darby soils are associated with soils of the moderately deep, red, clayey Bellpine series over soft bedrock; the moderately deep, red, clayey Nekia series over hard rock; the deep, red, clayey Jory series; the moderately deep, clayey-skeletal Ritner series; and the shallow, loamy-skeletal Witzel series.

Soil Behavior and Recommendations:

Darby soils support productive stands of Douglas-fir and incense cedar. The average site index is 106 for northerly aspects and 95 for southerly aspects.

Clearcutting is the recommended harvesting practice for Darby soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with

young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grasses, poison oak, and other species is a problem on both aspects. It is worse on south aspects. Heavy stands of poison oak are common on old clearcuts in Darby soils. The recommended practice is to clearcut both aspects and apply herbicides to units for 2 to 3 years following planting. Units should be planted the first winter following logging. This helps get the trees established before the unit is invaded with pioneering vegetation.

Darby soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Darby soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest time of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Darby soils have a high water holding capacity. The low amount of coarse fragments, the silty clay loam texture of the surface soil plus the clay texture of the upper part of the subsoil, and the high organic matter content all blend to produce a water holding capacity that is between 3.5 and 4.0 inches. This amount of moisture is adequate for survival of bare-root Douglas-fir seedlings in clearcuts. Darby soils occur at low elevations where radiation loads are high and evaporation is high. The success of bare-root Douglas-fir seedlings is moderate on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be moderate. Darby soils occur at low elevations where radiation loads and evapotranspiration are high, hence the moisture that is stored in the soil is lost rapidly. Recommend shading newly planted trees to slow down the transpiration rate of the young seedlings.

Burning slash does not produce a significant increase in erosion on Darby soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendation is to spot burn wherever possible.

Road construction is generally easy in Darby soils. The material below the soil is usually soft, highly weathered basalt. Cut bank stability is high on slopes less than 30 percent and low on slopes over 30 percent. The most common failures are small slumps filling the ditches for 1 to 2 years after construction.

Sidecast from Darby soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Darby soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Darby soils are well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is moderately well suited to be used as a sealer for pond bottoms. The clay content is very high, making it difficult to get proper compaction. The clayey material sticks to equipment when it is wet up to optimum moisture. Usually 6 to 10 inches of compacted subsoil is adequate.

Fire trails constructed by hand have the least impact on the soil. If tractors are used, build closely spaced water bars.

Mapping Units:

397-24/W — Darby silty clay loam - Ritner gravelly silty clay loam association, 10 to 35 percent slopes. 756 acres. Deep, clayey Darby soils make up about 60 percent of the area and moderately deep, clayey-skeletal Ritner soils make up about 40 percent of the area. The Darby soils are mostly on broad rounded ridgetops, smooth sideslopes, and in broad concave drainage ways. The Ritner soils are mostly on the steeper sideslopes and on narrow ridgetops. Mingled with the Ritner soils are minor inclusions of the nonskeletal, clayey Bellpine soils, and the shallow, loamy-skeletal Witzel soils.

397-36/X — Darby silty clay loam - Witzel cobbly silt loam association, 35 to 65 percent slopes. 1361 acres. Deep, clayey Darby soils make up about 70 percent of the area, and shallow, loamy-skeletal Witzel soils make up about 30 percent of the area. The Darby soils are mostly on broad rounded ridgetops, smooth sideslopes, and in broad, concave drainage ways.

The Witzel soils are mostly on steep south facing sideslopes and on sharp ridge crests. Mingled with the Darby soils are minor inclusions of the moderately deep Bellpine soils. Mingled with the Witzel soils are minor inclusions of the clayey-skeletal Ritner soils and rock land.

397-R-24/X Darby silty clay loam - Rock land - Ritner gravelly clay loam association, 35 to 65 percent slopes, predominantly southerly. 668 acres. Deep, clayey Darby soils make up about 45 percent of the area; rock land makes up about 30 percent of the area; and moderately deep, clayey-skeletal Ritner soils make up about 25 percent of the area. The Darby soils are mostly on rounded ridgetops, smooth sideslopes and in broad concave drainage ways. The rock land is mostly on sharp ridge crests and the steeper sideslopes. The Ritner soils are mostly on the narrow ridgetops and the steeper sideslopes. Mingled with the Darby soils are minor inclusions of the moderately deep, clayey Bellpine soils. Mingled with the rock land and Ritner soils are minor inclusions of the shallow, loamy-skeletal Witzel soils.

HOLDERMAN SERIES (400)

The Holderman series consists of moderately deep, loamy-skeletal brown, frigid soils formed in colluvium from volcanic rocks in areas receiving from 60 to 90 inches of precipitation. These soils occur on gently sloping to steep slopes in the Cascade Mountains at elevations above 2800 feet.

Profile Description: Holderman gravelly loam

Surface Soil:	0-5"	Dark yellowish brown, gravelly loam, friable, strongly acid, (3 to 10 inches thick).
Subsoil:	5-32"	Dark yellowish brown, very gravelly loam, friable, strongly acid, (12 to 35 inches thick).
Substrata:	32"+	Hard, slightly fractured andesite.
Representative Profile:	NE¼, SW¼, Sec. 26, T. 26 S., R. 2 W., on road 26-3-34.2, 10.6 miles from its origin.	

Variations: Depth to bedrock ranges from 20 to 40 inches. Rock fragment content ranges from 35 to 75 percent. The color of the surface soils is very dark grayish brown, dark brown, dark grayish brown, or dark yellowish brown. The texture of the surface soil is gravelly loam or very gravelly loam. The color of the subsoil is dark yellowish brown, brown, or yellowish brown. The texture of the subsoil is very gravelly loam, or very cobbly loam.

Setting: Holderman soils occur on gentle to very steep slopes in the Cascade Mountains at elevations of 2800 to 4700 feet. The soils form in colluvium from light colored andesite, tuffaceous rocks, or breccia. Winters are cold and moist and summers are cool and dry. Average annual precipitation is 55 to 90 inches. The soils are dry for less than 45 days between depths of 4 and 12 inches during the summer period. The mean annual temperature is about 43° F., the mean January temperature is about 31° F., and the mean July temperature is about 55° F. The frost-free period is between 100 and 160 days. The native vegetation has a canopy of Douglas-fir, western hemlock, noble fir, knobcone pine, and western white pine with an understory of red huckleberry, blue huckleberry, beargrass, and rhododendron.

Holderman soils are associated with soils of the shallow, loamy-skeletal Winberry series; the deep, fine-loamy Cruiser series; and rock land. On adjacent slopes at lower elevations in the mesic temperature regime, Holderman soils merge with soils of the Blachly, Kilchis, Harrington, Twindar, Zango, Shippa, Vena, and Freezner series.

Soil Behavior and Recommendations:

Holderman soils support stands of Douglas-fir with hemlock and a few true firs. Average site index is 70 for northerly aspects and 87 for southerly aspects. Cold soil temperatures are partly responsible for low site index on north aspects.

The upper 20 inches of Holderman soils have a moderately low water holding capacity. The high amount of coarse fragments, the loam texture, and the moderate amount of organic matter blend to produce a water holding capacity between 1.5 and 2.0 inches. This amount of moisture is adequate for survival of Douglas-fir seedlings in clearcuts. These soils have a short growing season because of low soil temperatures.

Clearcutting is the recommended harvesting practice for Holderman soils. These soils occur in cool moist environments where partial cutting would encourage the growth of hemlock especially on north aspects. Competing vegetation is usually not a problem in reforesting these soils.

Getting these soils planted in fall is difficult because of early deep snows. Recommendation is to consider spring planting. The success of spring planting will depend on a number of factors, such as how early the snow leaves, how much soil moisture there is at the time of planting, and how hot the spring soil temperatues are.

Burning slash does not produce a significant increase in erosion on northerly aspects. Losses of inorganic potassium and phosphorous do not appear to be significant. There are substantial losses of nitrogen, organic phosphorous and sulfur through volatilization and runoff. Recommendation is to spot burn where possible.

Road construction requires ripping and blasting. The material below the soil is usually hard volcanic rocks. Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out on slopes over 80 percent. Recommend end hauling.

Sidecast from Holderman soils on slopes less than 80 percent is normally stable. Sidecast responds well to seeding and mulching. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching. Species that can tolerate short growing seasons and cold temperatures should be used for seeding fill slopes.

Rocking roads is necessary for winter hauling.

Most of the Holderman soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Holderman soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Mapping Units:

400-19-410/X — Holderman gravelly loam - Cruiser gravelly loam - Winberry very gravelly loam association, 35 to 65 percent slopes. 1835 acres. Moderately deep Holderman soils make up about 45 percent of the area; deep, red, fine-loamy Cruiser soils make up about 30 percent of the area; and shallow Winberry soils make up about 25 percent of the area. The Holderman and Winberry soils are mostly on the ridgetops and steeper sideslopes. The Cruiser soils are mostly on broad ridgetops, in saddles, and on smooth sideslopes. Mingled with the Winberry soils are minor inclusions of rock land. Some areas of the Cruiser soils have more than 35 percent rock fragments.

400-410/W — Holderman gravelly loam - Winberry very gravelly loam association, 10 to 35 percent slopes. 881 acres. Moderately deep Holderman soils make up about 70 percent of the area, and shallow Winberry soils make up about 30 percent of the area. The Holderman soils are mostly on the broader ridgetops and smooth sideslopes. The Winberry soils are mostly on sharp ridge crests, slump escarpments and steep dissected sideslopes. Mingled with the Holderman soils are minor inclusions of Cruiser soils. Mingled with the Winberry soils are minor inclusions of rock land.

400-410/WX — Holderman gravelly loam - Winberry very gravelly loam association, 10 to 65 percent slopes. 1538 acres. Moderately deep Holderman soils make up about 65 percent of the area, and shallow Winberry soils make up about 35 percent of the area. The Holderman soils are mostly on the broader ridgetops and smooth sideslopes. The Winberry soils are mostly on sharp ridge crests, slump escarpments, and steep dissected sideslopes. About 70 percent of the slopes have gradients between 10 and 35 percent and about 30 percent have gradients between 35 and 65 percent. Mingled with the Holderman soils are minor inclusions of Cruiser soils. Mingled with the Winberry soils are minor inclusions of rock land.

400-410/X Holderman gravelly loam - Winberry very gravelly loam association, 35 to 75 percent slopes. 2991 acres. Moderately deep Holderman soils make up about 65 percent of the area, and shallow Winberry soils make up about 35 percent of the area. The Holderman soils are mostly on the broader ridgetops and smooth sideslopes. The Winberry soils are mostly on sharp ridge crests, slump escarpments, and steep dissected sideslopes. Mingled with the Holderman soils are minor inclusions of Cruiser soils. Mingled with the Winberry soils are minor inclusions of rock land.

400-410/XY Holderman gravelly loam - Winberry very gravelly loam association, 35 to 90 percent slopes. 2006 acres. Moderately deep Holderman soils make up about 65 percent of the area, and shallow Winberry soils make up about 35 percent of the area. The Holderman soils are mostly on the broader ridgetops and smooth sideslopes. The Winberry soils are mostly on sharp ridge crests, slump escarpments, and steep dissected sideslopes. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Mingled with the Holderman soils are minor inclusions of Cruiser soils. Mingled with the Winberry soils are minor inclusions of rock land.

400-410/YX Holderman gravelly loam - Winberry very gravelly loam association, 35 to 90 percent slopes. 2686 acres. Moderately deep Holderman soils make up about 60 percent of the area, and shallow Winberry soils make up about 40 percent of the area. The Holderman soils are mostly on the broader ridgetops and smooth sideslopes. The Winberry soils are mostly on sharp ridge crests, slump escarpments, and steep dissected sideslopes. About 70 percent of the slopes have gradients between 65 and 90 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with the Holderman soils are minor inclusions of Cruiser soils. Mingled with the Winberry soils are minor inclusions of rock land.

400-410/Y Holderman gravelly loam - Winberry very gravelly loam association, 65 to 90 percent slopes. 2675 acres. Moderately deep Holderman soils make up about 60 percent of the area, and shallow Winberry soils make up about 40 percent of the area. The Holderman soils are mostly on the broader ridgetops and smooth sideslopes. The Winberry soils are mostly on sharp ridge crests, slump escarpments, and steep dissected sideslopes. Mingled with the Holderman soils are minor inclusions of Cruiser soils. Mingled with the Winberry soils are minor inclusions of rock land.

400-410-R/Y

Holderman gravelly loam - Winberry very gravelly loam - Rock land association, 65 to 90 percent slopes. 1413 acres. Moderately deep Holderman soils make up about 30 percent of the area, and rock land occupies about 20 percent. The remaining 10 percent is inclusions of unnamed dark colored very gravelly loam, moderately deep soils. The Holderman soils are mostly on the broader ridgetops and smooth sideslopes. The Winberry soils are mostly on sharp ridgetops and very steep sideslopes. Rock land is found in very steep headwalls, ridgetops and adjacent to streams.

WINBERRY SERIES (410)

The Winberry series consists of shallow, loamy-skeletal, brown, frigid soils formed in colluvium from volcanic rocks in areas receiving from 60 to 90 inches of precipitation. They occur on ridgetops and sideslopes in the Cascade Mountains at elevations above 2800 feet.

Profile Description: Winberry very gravelly loam

Surface Soil:	0-5"	Very dark grayish brown, very gravelly loam, friable, strongly acid, (3 to 8 inches thick).
Subsoil:	5-18"	Dark brown, very cobbly loam, friable, strongly acid, (4 to 6 inches thick).
Substrata:	18"+	Hard, slightly fractured andesite.
Representative Profile:	SE¼, SE¼, Sec. 26, T. 26 S., R. 2 W., on road 26-3-34.2, 11.1 miles from its origin.	

Variations: Depth to bedrock ranges from 10 to 20 inches. Rock fragment content ranges from 35 to 75 percent. The color of the surface soil is very dark grayish brown, dark brown, dark grayish brown, or dark yellowish brown. The texture of the surface soil is gravelly loam or very gravelly loam. The color of the subsoil is dark yellowish brown, dark brown or yellowish brown. The texture of the subsoil is very gravelly loam, or very cobbly loam.

Setting: Winberry soils occur on gentle to very steep slopes in the Cascade Mountains at elevations of 2800 to 4700 feet. The soils formed in colluvium from light colored andesite, tuffaceous rocks or breccia. Winters are cold and moist and summers are cool and dry. Average annual precipitation is 55 to 90 inches. The soils are dry for less than 45 days between depths of 4 and 12 inches during the summer period. The mean annual temperature is about 43° F., the mean January temperature is about 31° F., and the mean July temperature is about 55° F. The frost-free period is between 100 and 160 days. The native vegetation has a canopy of Douglas-fir, western hemlock, noble fir, knobcone pine, and western white pine with an understory of red huckleberry, blue huckleberry, bear grass and rhododendron.

Winberry soils are associated with soils of the moderately deep, loamy-skeletal Holderman series; the deep, fine-loamy Cruiser series; and rock land. On adjacent slopes at lower elevations in the mesic temperature regime, Winberry soils merge with soils of the Blachly, Kilchis, Harrington, Twindar, Zango, Shippa, Vena, and Freezner series.

Soil Behavior and Recommendations:

Winberry soils support stands of Douglas-fir with hemlock. Average site index is not available for northerly aspects and 78 for southerly aspects.

The upper 20 inches of Winberry soils have a low water-holding capacity. The high amount of coarse fragments, the loam texture, and the moderately high amount of organic matter blend to produce a water-holding capacity between 1.0 and 1.5 inches. Clearcutting is recommended for northerly aspects. Partial cutting encourages hemlock. Strip cuts, small clearcuts, or artificial shade is recommended for southerly aspects. Planting these soils in the fall is difficult because of early deep snows, so spring planting should be considered. The success of spring planting will depend on how early the snow leaves, how much soil moisture there is at the time of planting, and how hot the spring soil temperatures are.

Burning slash does not produce a significant increase in erosion on northerly aspects. Losses of inorganic potassium and phosphorous do not appear to be significant. There are substantial losses of nitrogen, organic phosphorous and sulfur through volatilization and runoff. Recommendation is to spot burn where possible.

Road construction requires blasting and some ripping. The material below the soil is usually hard volcanic rocks. Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out on slopes over 80 percent.

Sidecast from Winberry soils on slopes less than 80 percent is normally stable. Sidecast does not respond well to seeding and mulching. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Most of the Winberry soils occur on slopes too steep for tractor logging. Calbe logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Winberry soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Mapping Units:

410-400/Y — Winberry very gravelly loam - Holderman gravelly loam association, 65 to 90 percent slopes. 837 acres. Shallow Winberry soils make up about 60 percent of the area, and moderately deep Holderman soils make up about 40 percent of the area. The Winberry soils are mostly on sharp ridge crests and very steep dissected sideslopes. The Holderman soils are mostly on slump benches and in drainage ways of dissected sideslopes. Mingled with the Winberry soils are minor inclusions of rock land. Mingled with the Holderman soils are minor inclusions of Cruiser soils.

410-R/Yn — Winberry very gravelly loam - Rock land association, 65 to 90 percent slopes, predominantly northerly. 471 acres. Shallow Winberry soils make up about 60 percent of the area, and rock land makes up about 40 percent of the area. The Winberry soils are mostly on very steep dissected sideslopes. The rock land is mostly on sharp ridge crests and on headwalls of deeply incised streams. Mingled with the Winberry soils are minor inclusions of Holderman soils. Mingled with the rock land are areas of rock outcrop.

UMPCOOS SERIES (564)

The Umpcoos series consists of shallow, brown, gravelly loam soils derived from sandstone colluvium that occurs on very steep slopes and headwalls.

Profile Description: Umpcoos gravelly loam

Surface Soil:	0-3"	Dark brown gravelly loam, very friable, medium acid, (2 to 5 inches thick).
Subsoil:	3-18"	Dark brown, very gravelly silt loam, friable, medium acid, (6 to 14 inches thick).
Substrata:	18"+	Hard sandstone.
Representative Profile:	On 21-7-14.2 road in the NW¼, NW¼, Sec. 14, T. 21 S., R. 7 W.	

Variations: Depth to hard, smooth bedrock is from 10 to 20 inches. Coarse fragment content ranges from 15 to 30 percent in the surface soils and 35 to 65 percent in the subsoil. The surface soil colors are brown or dark brown. The subsoil colors are dark brown or brown. The surface soil texture is loam or gravelly loam. The subsoil textures are gravelly loam, very gravelly loam, and very gravelly silt loam.

Setting: Umpcoos soils occur on very steep sideslopes and very steep headwalls. They occur on Tyee sandstone at elevations of 600 to 2500 feet. The climate is a modified maritime, with a summer dry season and an annual precipitation of 50 to 80 inches. The mean annual air temperature is 51° F., the average January temperature is 40° F., and the average July temperature is 63° F. The frost-free season is 180 days.

The native vegetation is Douglas-fir, Oregon grape, sword fern, and low vigor salal. Umpcoos soils are associated with Digger (66) and Jason (64). Digger soils are moderately deep and Jason soils occur over highly fractured bedrock.

Soil Behavior and Recommendations:

Umpcoos soils support stands of Douglas-fir. Average site index is 88 for both northerly and southerly aspects.

The soil has a low water holding capacity. The high amount of coarse fragments, the loam texture, and the moderate amount of organic matter produce a water holding capacity that is between 1.0 and 2.0 inches. This amount of moisture is not adequate for survival of bare-root Douglas-fir in clearcuts on southerly aspects. Partial cutting or strip cutting is recommended.

On northerly aspects, clearcutting is recommended.

These soils frequently have less than normal stocking. The soil does not have the water holding capacity to support a normal stocking. Recommendation is to reduce the volume per acre that normal yield tables say can be produced.

Most of the Umpcoos soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Umpcoos soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Broadcast, hot, slash burning does cause erosion on Umpcoos soils when they occur on 70 percent southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder to get seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn these soils.

Burning slash does not produce a significant increase in erosion on northerly aspects. Recommendation is to spot burn where possible.

Road construction requires mostly blasting. The material below the soil is usually hard sandstone. Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out.

Road construction can cause severe erosion on Umpcoos soils when they are on sideslopes over 80 percent or in draws with slopes over 75 percent. When sidecast becomes saturated it overloads the soil below it and triggers large debris avalanches. Recommendations are:

1. Avoid building roads in these soils.

2. If roads must be built, then roll the grade, keep them narrow, and end haul. Local experience has shown that doing these items substantially reduced debris avalanches. Particular attention needs to be given to the way the pioneer road is constructed. In very steep segments no pioneer is recommended. In other areas where a pioneer road can be used, a small cat with a U-shaped blade is recommended. Figure 32 shows a berm that is helpful to prevent sidecast from being lost over the side.

Selection of disposal sites requires as much care as does the location and construction of the road.

Sidecast from Umpcoos soils on slopes less than 80 percent is normally stable. Sidecast does not respond well to seeding and mulching. There are very few fines. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Mapping Units: The Umpcoos soils are not dominant in any of the mapping units. They are minor soils and inclusions in mapping units of the Jason soil series.

SISKIYOU SERIES (721)

The Siskiyou series consists of moderately deep, sandy somewhat excessively drained soils from granitoid rocks in the Siskiyou Mountains (see Figure 36). They occur on strongly sloping to very steep slopes.

Profile Description: Siskiyou sandy loam

Surface Soil:	0-10"	Dark yellowish brown sandy loam, very friable, slightly acid, (5 to 15 inches thick).
Subsoil:	10-30"	Yellowish brown gravelly sandy loam, massive very friable, medium acid, (5 to 30 inches thick).
Substrata:	30"+	Weathered granitic bedrock.
Representative Profile:	The site is located on the 13-3-3.1 road near its junction with 31-3-11.0 road in the SW¼, SW¼, Sec. 12, T. 31 S., R. 3 W.	

Variations: Depth to massive weathered bedrock ranges from 20 to 40 inches. Coarse fragment content ranges from 5 to 35 percent. Surface colors are dark yellowish brown, yellowish brown, dark brown, or brown. Subsoil colors are dark yellowish brown, yellowish brown, olive brown, or light olive brown. Textures of surface and subsurface soils are sandy loam, or gravelly sandy loam.

Setting: The Siskiyou soils occur on moderately steep to very steep hills and mountains at elevations of 1200 to 4000 feet. Slope gradients range from 10 to 85 percent with slopes over 35 percent being most common. The soils formed in colluvium from granitoid rocks. Summers are warm and dry and winters are cool and moist. The mean annual precipitation ranges from 30 to 50 inches. The mean annual temperature ranges from 47° to 54° F., the mean January temperature centers on 36° F., and the mean July temperature centers on 70° F. The frost-free period ranges from 130 to 170 days. Native vegetation consists of ponderosa pine, Douglas-fir, madrone and associated shrubs and forbs.

The Siskiyou soils are associated with soils of the deep, fine-loamy Holland series from granitoid rocks. Adjacent areas with soils from metatmorphic rocks are occupied by soils of the Pollard, McGinnis, Vermisa and Kanid series. Adjacent areas with soils from serpentine are mainly covered with soils of the (770) Pearsoll series and (R) rock land.

The Siskiyou soils are sandier than all the other moderately deep soils in the District.

Soil Behavior and Recommendations:

Siskiyou soils support productive stands of Douglas-fir with incense cedar, ponderosa pine, and sugar pine. Average site index is 96 for northerly aspects and 81 for southerly aspects.

Road construction is easy because most of the material can be pushed rather than ripped. The material below the soil is decomposed granite.

Cut bank stability changes dramatically with increase in slopes. On slopes of less than 50 percent, cut banks will have small failures for 1 to 3 years after construction. On slopes between 50 and 70 percent, the number of failures increases and occurs for 1 to 5 years. On slopes over 70 percent, cut bank failures are large. They occur for 1 to 5 years after construction and work their way up the slope 75 to 200 feet above the cut bank.

The most common soil failure associated with roads is sidecast sluicing out when it is placed on slopes over 70 percent. Cut bank failures run a close second when roads are built on 70 percent or greater slopes. The recommendation is to locate roads on slopes of less than 50 percent. If this is not possible under a high lead operation, the recommendation is to use another yarding method that does not require the road.

For short distances that must be built on slopes over 70 percent, end hauling is strongly recommended. End hauling works best in this soil when no pioneer road is used.

For roads built in Siskiyou soils regardless of the slope, the following recommendations apply:

1. In-slope the subgrade 5 percent.
2. Install extra culverts.
3. Roll the grade to reduce the amount of cutting.
4. Rock the ditches.
5. Seed, mulch, and fertilize cut banks and fills.
6. Do all construction in the summer months.
7. Keep the road narrow.
8. Rock all roads including spurs before the winter rains.

Removing the canopy on Siskiyou soils in headwall areas of over 70 percent produces debris avalanches. These are not associated with roads. Usually a debris avalanche (see Figure 37) begins in the upper end of a headwall and overloads the soil below it. The overloaded soil fails, sending a larger mass down to overload the soil below it. The slide picks up speed and begins to scour away soil and debris in its path. Frequently, the debris avalanches do not stop until they reach a main stream channel where the gradient is nearly flat. They occur most often on north aspects in Slide Creek, Riser Creek, Copperhead Creek, and McKay Creek.

To prevent debris avalanching, leave the canopy in the headwalls on slopes over 70 percent. Partial cutting them has not worked.

There is another type of soil failure that occurs in Siskiyou soils. It occurs when the canopy is removed. Small debris flows or "pop-outs" travel a short distance and usually come to rest in the unit. They are usually 25 x 50 feet in size. In three or four years, forbs, grasses, trees, and brush become established in the scar. They are not a serious problem where they occur on sideslopes away from stream channels.

Burning of slash is not recommended on these soils. Removing vegetation accelerates erosion on these soils.

Rocking roads in Siskiyou soil is necessary for winter logging. Rocking and water barring temporary roads is recommended. Unrocked roads in this soil erode severely.

Hand-built fire trails are recommended for slopes of more than 30 percent. Tractor trails on slopes of more than 30 percent erode severely and are very difficult to effectively water bar.

Siskiyou soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush) on north aspects. This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendations are to seed units in Siskiyou soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

The upper 20 inches of Siskiyou soils have a medium to low water-holding capacity. The low amount of coarse fragments, the fine sandy loam texture of the surface soil plus the sandy loam texture of the upper part of the subsoil, and the moderate amount of organic matter content blend to produce a water-holding capacity that is between 1.5 and 3.0 inches. This amount of moisture is adequate for survival of bare-root Douglas-fir seedlings in clearcuts on north aspects. The success of bare-root Douglas-fir seedlings is high on northerly aspects.

Figure 36. A cut bank made in "decomposed granite." Material at the base of the cut has accumulated over a 4-year period. It results mainly from dry ravel of the cut bank.

Figure 37. Headwalls, such as this one, that have Siskiyou and Holland soils fail when the canopy is removed. Failures are usually shallow.

On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading may be needed on direct west and south aspects when slopes are over 70 percent.

Most of the Siskiyou soils occur on slopes too steep for tractor logging. Cable logging is the recommended practice. Occasional areas areas of this soil are on slopes gentle enough for tractor yarding. Siskiyou soils have a low clay content and are not as easily compacted as the red clay soils. On areas that have slopes of less than 25 percent, Siskiyou soils can safely be tractor-logged provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. All major skid trails be water barred.

Clearcutting is the recommended harvesting practice for Siskiyou soils on slopes less than 70 percent and away from headwalls.

Competition from grass and other species is not a problem on northerly aspects. However, on southerly aspects it is. The recommended practice is to clearcut northerly aspects and gently sloping south aspects. Herbicides will need to be used for 1 to 2 years after planting. For steep southerly aspects that have low volume, partial cutting is recommended.

Siskiyou soils are poorly suited for helipond locations because the soil is very porous and steep. They are poorly suited for material to construct small earth dams because they contain low clay content.

Mapping Units:

721-723/XW	Siskiyou sandy loam - Barron gravelly loam association, 10 to 65 percent slopes. 1834 acres. Moderately deep Siskiyou soils occupy about 60 percent of the unit. Deep Barron soils make up about 40 percent of the unit. The Siskiyou soils are on steep sideslopes and in headwalls. The Barron soils occur on the gentler portions of the unit such as gentle ridgetops and near stream bottoms. These soils occur mostly south of the South Umpqua Highway. About 70 percent of the slopes have gradients between 35 and 65 percent. Inclusions of deep Holland soils occur in the unit at random.

721-723/XY Siskiyou sandy loam - Barron gravelly loam association, 35 to 90 percent slopes. 3147 acres. Moderately deep Siskiyou soils occupy about 70 percent of the unit. Deep Barron soils make up about 30 percent. The Siskiyou soils are on steep sideslopes and in headwalls. The Barron soils occur on the gentler portions of the unit such as gentle ridgetops and near stream bottoms. These soils occur mostly south of the South Umpqua Highway. About 70 percent of the slopes have gradients between 35 and 65 percent. Inclusions of deep Holland soils occur in the unit at random.

HOLLAND SERIES (722)

The Holland series consists of deep, loamy, reddish brown, well-drained soils from granitic materials in the Siskiyou Mountains. They occur on gently sloping to steep footslopes and alluvial fans.

Profile Description: Holland loam

Surface Soil:	0-10"	Dark brown loam, friable, slightly acid, (8 to 20 inches thick).
Subsoil:	10-65"	Dark reddish brown clay loam, firm, slightly acid, (39 to 60 inches thick).
Substrata:	65"+	Strongly weathered granitic rock.
Representative Profile:	The site is located 3 miles up the 29-4-20.0 road in NE¼, NE¼, Sec. 19, T. 29 S., R. 4 W.	

Variations: Depth to weathered bedrock is from 40 to 100 inches and usually is deeper than 60 inches. Coarse fragment content ranges from 3 to 25 percent. Surface soil colors are grayish brown, dark brown, or brown. Subsoil colors are reddish brown, reddish yellow, yellowish red, brown, or strong brown. Surface soil textures are loam or sandy loam. Subsoil textures are clay loam or sandy clay loam.

Setting: The Holland soils occur on gently sloping to steep strongly dissected slopes at elevations of 1200 to 3000 feet (see Figure 38). Slope gradients range from 3 to 60 percent but slopes between 3 and 35 percent are most common. The soils formed in colluvium from grantioid rocks. A phase of the Holland soil occurs over metavolcanic rocks, and is given the map symbol 722m.

The summers are warm and dry and the winters are cool and moist. The mean annual precipitation ranges from 30 to 50 inches. The mean annual temperature ranges from 50° to 54° F., the mean January temperature centers on 36° F., and the mean July temperature centers on 70° F. The frost-free period ranges from 130 to 170 days. Native vegetation consists of ponderosa pine, Douglas-fir, madrone, white oak and an associated understory of shrubs, forbs and grasses.

The Holland soils are associated with soils of the moderately deep Siskiyou soils from granitoid rocks. Adjacent areas with soils from metamorphic, sedimentary and volcanic rock are occupied by soils of the Siskiyou, Barron, and Lettia series.

The Holland soils are similar to the deep, reddish soils of the Pollard, Tishar and McGinnis series from metamorphosed rocks, but all of these are more clayey in the subsoil. The deep, reddish soils of the Freezner series from volcanic rocks is more clayey in the subsoil than Holland soils.

Soil Behavior and Recommendations (Holland soils over granite) (722):

Holland soils support productive stands of Douglas-fir with incense cedar, and ponderosa pine. Average site index is 108 for northerly aspects and 88 for southerly aspects.

Road construction is easy because most of the material can be pushed rather than ripped. The material below the soil is decomposed granite.

Cut bank stability changes dramatically with increase in slope. On slopes of less than 50 percent, cut banks will have small failures that will occur for 1 to 3 years after construction. On slopes between 50 and 70 percent the number of failures increases and occurs for 1 to 5 years. On slopes over 70 percent cut bank failures are large. They occur for 1 to 5 years after construction and work their way up slope 75 to 200 feet above the cut bank. Sidecast material is very erosive on slopes over 60 percent, as illustrated in Figure 39. Also, ditchline erosion can be severe, as shown in Figure 40.

The most common soil failure associated with roads is sidecast sluicing out when it is placed on slopes of over 70 percent. Cut bank failures run a close second when roads are built on 70 percent or greater slopes. Recommendation is to locate roads on slopes of less than 50 percent. If this is not possible under a high lead operation, the recommendation is to use another yarding method that does not require the road.

For short distances that must be built on slopes over 70 percent, end hauling is strongly recommended. End hauling works best in this soil when no pioneer road is used.

For roads built in Holland soils regardless of the slope, the following recommendations apply.

1. In-slope the subgrade 5 percent.
2. Install extra culverts.
3. Roll the grade to reduce the amount of cutting.
4. Rock the ditches.
5. Seed, mulch, and fertilize cut banks and fills.
6. Do all construction in the summer months.
7. Keep the road narrow.
8. Rock all roads including spurs before the winter rains.

Figure 38 (left). Typical steeply dissected topography where Holland and Siskiyou soils are found. Sidecast from these two soils is very erosive as shown in Figure 39 below.

Figure 40 (left). Ditchline erosion is common on roads built in Holland soils. Check dams made by dumping coarse rocks in the ditch is recommended.

Removing the canopy on Holland soils in headwall areas of more than 70 percent produces debris avalanches. These are not associated with roads. Usually a debris avalanche begins in the upper end of a headwall and overloads the soil below it. The overloaded soil fails, sending a larger mass down to overload the soil below it. By this time, the slide has picked up speed and begins to scour away soil and debris in its path. Frequently, the debris avalanches do not stop until they reach a main stream channel where the gradient is nearly flat. They occur most often on north aspects in Slide Creek, Riser Creek, Copperhead Creek, and McKay Creek.

Figure 41. A small shallow slide referred to here as a "pop-out."

To prevent debris avalanching, leave the canopy in the headwalls on slopes over 70 percent. Partial cutting them has not worked.

There is another type of soil failure that occurs in Holland soils. It occurs when the canopy is removed. Small debris flows or "pop-outs" travel a short distance and usually come to rest in the unit (see Figure 41). They are usually 25 x 50 feet in size. In three or four years, forbs, grasses, trees, and brush become established in the scar. They are not a serious problem where they occur on sideslopes away from stream channels.

Burning of slash is not recommended on these soils. Removing vegetation accelerates erosion.

Rocking roads in Holland soil is necessary for winter logging. Rocking and water-barring temporary roads is recommended. Unrocked roads in this soil erode severely.

Hand-built fire trails are recommended for slopes of more than 30 percent. Tractor trails on slopes of more than 30 percent erode severely and are very difficult to effectively water-bar.

Holland soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush) on north aspects. This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. To insure establishment of Ceanothus velutinus, seed units in Holland soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

The upper 20 inches of Holland soils have a moderately high water-holding capacity. The low amount of coarse fragments, the loam texture of the surface soil plus the gravelly clay loam texture of the upper part of the subsoil, and the moderate amount of organic matter all blend to produce a water-holding capacity that is between 3.0 and 3.5 inches. This amount of moisture is adequate for the survival of bare-root Douglas-fir seedlings in clearcuts. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading is not needed on Holland soils.

Holland soils are medium to low in clay content. They compact from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Holland soils provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 25 to 30 percent.

4. All major skid trails be water barred.

Clearcutting is the recommended harvesting practice for Holland soils on slopes less than 70 percent, away from headwalls. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 2 years following planting. Units should be planted the first winter following logging. This helps get the trees established before the unit is invaded by pioneering vegetation.

Holland soils are moderately well suited for helipond locations because deep cuts will get into porous material. The subsoil of this soil can be used as a sealer. A compacted 6 to 10 inches is recommended for a sealer. They are well suited for material to construct small earth dams.

Soil Behavior and Recommendations (Holland soils over old metavolcanic rocks) (722m):

All the above statements apply except:

1. Holland soils over old metavolcanic rocks are more stable on slopes over 70 percent when the canopy is removed. Clearcutting does not cause headwalls to fail and scour out draws. It is recommended to clearcut them.

2. When roads are built through Holland soils over metavolcanics on slopes less than 70 percent, "normal" road construction can be used.

3. Site index is 125 on northerly aspects and 104 on southerly aspects.

Mapping Units:

722-724/WX	Holland loam - Lettia loam association, 10 to 65 percent slopes. 4533 acres. Deep Holland soils occupy about 60 percent while Lettia makes up about 40 percent of the unit. Holland soils occur on the steeper portions of the unit. They are on slopes of 25 to 60 percent. Lettia soils occur on the gentle topography with slopes of less than 30 percent. About 70 percent of the slopes have gradients between 10 and 35 percent. Inclusions of Selmac soils are found in depressional areas and Siskiyou soils in the steep draws.

722-724/X — Holland loam - Lettia loam association, 35 to 65 percent slopes. 5031 acres. Deep Holland soils occupy about 70 percent while Lettia makes up about 30 percent of the unit. Holland soils occur on the steeper portions of the unit. Lettia soils occur on the gentle topography. Inclusions of Selmac soils are found in depressional areas and Siskiyou soils in the steep draws.

722m-724m/W — Holland loam - Lettia loam association, 10 to 35 percent slopes. 535 acres. This association occurs on old metavolcanic rocks of the Applegate and Rogue Formations. Deep Holland soils occupy about 55 percent of the unit. Deep clayey Lettia soils make up about 45 percent of the unit. Holland soils are on the steeper portions of the area. Lettia soils occupy the broad ridgetops, old landslides and gentle sideslopes with gradients less than 30 percent. Inclusions of a moderately deep, fine-loamy soil occur with Holland. Also Selmac soils are at the toe of long slopes and in wet spots.

722m-724m/X — Holland loam - Lettia loam association, 35 to 65 percent slopes. 11,975 acres. This association occurs on old metavolcanic rocks of the Applegate and Rogue Formations. Deep Holland soils occupy about 70 percent of the unit. Deep clayey Lettia soils make up about 30 percent of the unit. Holland soils are on the steeper portions of the area. Lettia soils occupy the broad ridgetops, old landslides, and gentle sideslopes. Inclusions of a moderately deep, fine-loamy soil occur with Holland. Also Selmac soils are at the toe of long slopes and in wet spots.

722-721/X — Holland loam - Siskiyou sandy loam association, 35 to 65 percent slopes. 1190 acres. Deep Holland soils make up 80 percent of the unit. Moderately deep Siskiyou occupies about 20 percent of the association. Holland soils are found on the sideslopes, ridgetops and ridge noses. Siskiyou soils are on the steep portions of the sideslopes and in headwalls. Inclusions of Lettia soils occur on the gentle topography.

722-721/Y — Holland loam - Siskiyou sandy loam association, 65 to 90 percent slopes. 3091 acres. Deep Holland soils make up 60 percent of the unit. Moderately deep Siskiyou occupies about 40 percent of the association. Holland soils are found on the sideslopes, ridgetops and ridge noses. Siskiyou soils are on the steep portions of the sideslopes and in headwalls. Inclusions of Lettia soils occur on the gentle topography mingled with Holland soils. Also a moderately deep fine-loamy soil occurs in headwalls.

722-721/Yn — Holland loam - Siskiyou sandy loam association, 65 to 90 percent slopes, northerly aspect. 1870 acres. Deep Holland soils make up 70 percent of the unit. Moderately deep Siskiyou occupies about 30 percent of the association. Holland soils are found on the sideslopes, ridgetops and ridge noses. Siskiyou soils are on the steep portions of the sideslopes and in headwalls. Inclusions of Lettia soils occur on the gentle topography. Also a moderately deep, fine-loamy unnamed soil occurs in headwalls.

722-743/W — Holland loam - Selmac sandy loam association, 10 to 35 percent slopes. 497 acres. The deep well-drained Holland soils are on the smooth sideslopes and convex positions. Selmac soils are at the base of long slopes just above streams. It is found in the wet spots. Holland soils occupy about 60 percent of the unit. Selmac soils make up about 20 percent of the area. The remaining 20 percent is inclusions of Lettia soils on the well-drained benches and Siskiyou soils on steep short slopes next to deeply dissected streams.

722-723/XW — Holland loam - Barron gravelly loam association, 10 to 65 percent slopes. 3598 acres. This unit is found south of the South Umpqua River. It is found on coarse-textured granitoid bedrock. The deep Holland soils make up about 60 percent of the area. Deep coarse textured Barron occupies about 40 percent. These two soils are intermingled through the unit. The Holland soils tend to occur on the gentle topography and the Barron soils are found on the steeper topography. However, both soils can occur anywhere in the unit. About 70 percent of the slopes have gradients between 35 and 65 percent. Inclusions of Siskiyou soils are found on the very steep slopes.

BARRON SERIES (723)

The Barron series consists of deep, brown, coarse textured soils occurring over granitic and dioritic colluvium and alluvium. They occur on gentle to rolling topography in areas of 20 to 40 inches of precipitation.

Profile Description: Barron gravelly loam

Surface Soil:	0-16"	Dark brown gravelly loam, very friable, strongly acid, (8 to 12 inches thick).
Subsoil:	16-57"	Yellowish brown, coarse, sandy loam, friable, strongly acid, (28 to 32 inches thick).
Substrata:	57"+	Highly weathered and fractured decomposed granite.
Representative Profile:	On 31-3-3.2 road in the SE¼, SW¼, Sec. 1, T. 31 S., R. 30 W.	

Variations: The soil depth varies from 40 to 60 inches. Coarse fragments are only a small percentage of fine gravel mixed in with the coarse sands. The surface soil colors are dark grayish brown or dark brown. The surface soil textures are coarse sandy loam or gravelly loam. The subsoil colors are light yellowish brown or yellowish brown. Subsoil textures are coarse sandy loam or sandy loam.

Setting: The Barron soils occur on nearly level to rolling slopes of outwash fans with slope gradients of 1 to 15 percent, and at elevations of 800 to 1800 feet. The soils have formed in moderately coarse textured granitic and dioritic colluvium and alluvium. The climate has warm, dry summers and cool, moist winters, with an annual precipitation of 20 to 40 inches. The average annual temperature is 54° F., the average January temperature is 40° F., and the average July temperature is 71° F. Average growing season is 140 to 160 days. Native vegetation consists of Douglas-fir, ponderosa pine, madrone, black oak, manzanita, and drought tolerant grasses and forbs.

Soil Behavior and Recommendations:

Barron soils support productive stands of Douglas-fir with incense cedar, ponderosa pine, and sugar pine. Average site index is 115 for northerly aspects and 107 for southerly aspects.

Road construction is easy because most of the material can be pushed rather than ripped. The material below the soil is decomposed granite.

Cut bank stability changes dramatically with increase in slope. On slopes less than 50 percent, cut banks will have small failures that will occur for 1 to 3 years after construction. On slopes between 50 and 70 percent the number of failures increases and occurs for 1 to 5 years. On slopes over 70 percent, cut bank failures are large. They occur for 1 to 5 years after construction and work their way up slope 75 to 200 feet above the cut bank.

The most common soil failure associated with roads is sidecast sluicing out when it is placed on slopes over 70 percent. Cut bank failures run a close second when roads are built on 70 percent or greater slopes. Recommendation is to locate roads on slopes less than 50 percent. If this is not possible under a high lead operation, the recommendation is to use another yarding method that does not require the road.

For short distances that must be built on slopes over 70 percent, end hauling is strongly recommended. End hauling works best in this soil when no pioneer road is used.

For roads built in Barron soils regardless of the slope, the following recommendations apply:

1. In-slope the subgrade 5 percent.

2. Install extra culverts.

3. Roll the grade to reduce the amount of cutting.

4. Rock the ditches.

5. Seed, mulch, and fertilize cut banks and fills.

6. Do all construction in the summer months.

7. Keep the road narrow.

8. Rock all roads including spurs before the winter rains.

Removing the canopy on Barron soils in headwall areas over 70 percent produces debris avalanches. These are not associated with roads. Usually a debris avalanche begins in the upper end of a headwall and overloads the soil below it. The overloaded soil fails, sending a larger mass down to overload the soil below it. By this time the slide has picked up speed and begins to scour away soil and debris in its path. Frequently, the debris avalanches do not stop until they reach a main stream channel where the gradient is nearly flat. They occur most often on north aspects in Slide Creek, Riser Creek, Copperhead Creak, and McKay Creek.

To prevent debris avalanching, leave the canopy in the headwalls on slopes over 70 percent. Partial cutting them has not worked.

There is another type of soil failure that occurs in Barron soils. It occurs when the canopy is removed. Small debris flows or "pop-outs" travel a short distance and usually come to rest in the unit. They are usually 25 x 50 feet in size. In three or four years, forbs, grasses, trees and brush become established in the scar. They are not a serious problem where they occur on sideslopes away from stream channels.

Burning of slash is not recommended on these soils. Removing vegetation accelerates erosion on these soils.

Rocking roads in Barron soil is necessary for winter logging. Rocking and water barring temporary roads is recommended. Unrocked roads in this soil erode severely.

Hand built fire trials are recommended for slopes over 30 percent. Tractor trails on slopes over 30 percent erode severely and are very difficult to effectively water bar.

Barron soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush) on north aspects. This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in Barron soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period, the brush can be sprayed with a herbicide to favor Douglas-fir.

The upper 20 inches of Barron soils have a medium to low water-holding capacity. The low amount of coarse fragments, the fine sandy loam texture of the surface soil plus the sandy loam texture of the upper part of the subsoil, and the moderate amount of organic matter all blend to produce a water-holding capacity that is between 1.5 and 3.0 inches. This amount of moisture is adequate for survival of bare-root Douglas-fir seedlings in clearcuts on north aspects. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading may be needed.

Barron soils are low in clay content. They compact from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Barron soils provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally, tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 25 to 30 percent.

4. All major skid trails be water barred.

Clearcutting is the recommended harvesting practice for Barron soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 2 years following planting. Units should be planted the first winter following logging. This helps get the trees established before the unit is invaded with pioneering vegetation.

Barron soils are poorly suited for helipond locations because they are very porous. They are poorly suited for material to construct small earth dams because of low clay content.

Mapping Units: Barron soils are minor in extent. They are associated with Siskiyou soils as a secondary component.

LETTIA SERIES (724)

The Lettia series consists of deep, clayey, well-drained soils that are forming in colluvium from granite. They occur on gentle sloping mountainous topography of 0 to 40 percent slopes, in areas of 30 to 50 inches of precipitation.

Profile Description: Lettia loam

Surface Soil:	0-12"	Dark brown loam, friable, medium acid, (10 to 18 inches thick).
Subsoil:	12-81"	Yellowish red clay, friable, strongly acid, (60 to 90 inches thick).
Substrata:	81"+	Highly weathered and fractured granite.
Representative Profile:	On the 28-4-27.0 road in SW¼, NW¼, Sec. 27, T. 28 S., R. 4 W.	

Variations: The soil depth ranges from 40 to over 80 inches in depth. Depth to hard bedrock is greater than 20 feet. Coarse fragment content ranges from 5 to 25 percent gravel. The surface soil colors are dark brown, brown, or yellowish brown. The surface soil texture ranges from loam to silty clay loam or sandy clay loam. The subsoil colors are yellowish red, reddish yellow, or strong brown. Subsoil texture ranges from clay to gravelly silty clay loam.

Setting: Lettia soils occur on sidehills, old slump benches, and broad ridgetops, with slopes of 0 to 40 percent. Elevation ranges from 500 to 2500 feet. The soils are forming in fine textured colluvium from granite. A phase of the Lettia series occurs over metavolcanic rocks and is given the map symbol of 724m. The climate has cool, moist winters and warm, dry summers. Mean annual temperature is 52° to 56° F., the mean July temperature is 67° F., and the mean January temperature is 40° F. The frost-free season is 120 to 200 days. Native vegetation consists of Douglas-fir, incense cedar, madrone, ocean spray, poison oak, grasses and some salal.

Lettia is associated with Holland, Siskiyou, Pollard and Abegg soils. Holland soils have an argillic horizon with a fine-loamy texture. Siskiyou soils have a cambic horizon. Pollard soils are Xerults. Abegg soils have a loamy-skeletal texture.

Soil Behavior and Recommendations (Lettia soils over granite) (724):

Lettia soils support productive stands of Douglas-fir with incense cedar, ponderosa pine, and sugar pine. Average site index is 119 for northerly aspects and 86 for southerly aspects.

Road construction is easy because most of the material can be pushed rather than ripped. The material below the soil is decomposed granite.

Cut bank stability is low for slopes over 20 percent. Numerous small slumps occur (see Figure 42). They fill ditches and produce large volumes of sediment. The sediment is clayey and is easily suspended in runoff water. Slumps occur for 1 to 3 years after construction. Recommendation is to construct roads using a ½:1 backslope. Slumping will occur. After 2 to 3 years the bank will be at the natural angle of response. Doing it this way prevents disturbing the extra soil that would have to be excavated if a flatter backslope was used. The entire length of the road does not have the slumping problem. Roughly 30 percent of the length of the road experiences the failures.

Figure 42. Small cut bank failure on Lettia soil.

Some areas of Lettia occur on old rotational slumps. Road locations need to be done with care through them. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the backslopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Lettia soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water.

Rocking roads in Lettia soil is necessary for winter logging. Rocking and water barring temporary roads is recommended. Unrocked roads in this soil erode severely.

Hand built fire trails are recommended for slopes over 30 percent. Tractor trails on slopes over 30 percent erode severely and are very difficult to effectively water bar.

Burning slash does not produce a significant increase in erosion on Lettia soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendation is to spot burn wherever possible.

Lettia soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush) on north aspects. This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in Lettia soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

The upper 20 inches of Lettia soils have a high water holding capacity. The low amount of coarse fragments, the loam texture of the surface soil plus the clay loam texture of the upper part of the subsoil, and the moderate amount of organic matter all blend together to produce a water holding capacity that is between 3.0 and 3.5 inches. This amount of moisture is adequate for the survival of Douglas-fir bare-root seedlings in clearcuts. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading is not needed.

Lettia soils are high in clay content. They compact easily from tractor logging. Cable logging has the least impact on this soil. However, tractor logging is an acceptable method of yarding on Lettia soils provided the following precuations are used:

1. Tractors are not allowed to operate during the wet season. Normally, tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest part of the year.

3. Tractors are not allowed to operate on slopes over 25 to 30 percent.

4. All major skid trails be water barred.

Clearcutting is the recommended harvesting practice for Lettia soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 2 years following planting. Units should be planted the first winter following logging. This helps get the trees established before the unit is invaded with poineering vegetation.

Lettia soils are well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 10 inches of compacted subsoil is adequate.

Soil Behavior and Recommendations (Lettia soils over old metavolcanic rocks):

All the above statements apply except for:

1. The site index for northerly aspects is 119 and for southerly aspects is 116.

2. Cut bank stability is high for Lettia soils over metavolcanic rocks on slopes under 35 percent. On steeper slopes, cut bank stability is low. Small slumps do occur. There are not as many as occur on Lettia soils over granite.

Mapping Units:

724-722/WX — Lettia loam - Holland loam association, 10 to 65 percent slopes. 2202 acres. This association has about 80 percent Lettia soils and about 20 percent Holland soils. Lettia soils occur on slopes mostly less than 40 percent. Holland soils are on steeper slopes. Lettia and Holland are intermingled through the unit. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Inclusions of Selmac soils occur in wet spots.

724-722/X — Lettia loam - Holland loam association, 35 to 65 percent slopes. 2271 acres. This association has about 55 percent Lettia soils and about 45 percent Holland soils. Lettia soils occur on slopes mostly less than 40 percent. Holland soils are on steeper slopes. Lettia and Holland are intermingled through the unit. Inclusions of Selmac soils occur in wet spots.

724m-722m/WX — Lettia loam - Holland loam association, 10 to 65 percent. 5678 acres. This association occurs on old metavolcanic rocks of the Galice and Rogue Formations. The deep clayey Lettia soils are on gentle topography such as broad ridgetops, smooth sideslopes, and old landslides. The deep fine-loamy Holland soils are on steep short slopes, ridge noses, and recent landslides. Lettia soils make up 70 percent and Holland soils occupy 30 percent of the association. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Mingled with these soils are Selmac soils in wet spots.

724m-722m/XW — Lettia loam - Holland loam association, 10 to 65 percent. 4556 acres. This association occurs on old metavolcanic rocks of the Galice and Rogue Formations. The deep, clayey Lettia soils are on gentle topography such as broad ridgetops, smooth sideslopes, and old landslides. The deep fine-loamy Holland soils are on steep short slopes, ridge noses and recent landslides. Lettia soils make up 60 percent and Holland soils occupy 40 percent. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 10 and 35 percent. Mingled with these soils are Selmac soils in wet spots.

724m-722m/X — Lettia loam - Holland loam association, 35 to 65 percent. 3194 acres. This association occurs on old metavolcanic rocks of the Galice and Rogue Formations. The deep clayey Lettia soils are on gentle topography such as broad ridgetops, smooth sideslopes and old landslides. The deep fine-loamy Holland soils are on steep short slopes, ridge noses and recent landslides. Lettia soils make up 55 percent and Holland soils occupy 45 percent of the association. Mingled with these soils are Selmac soils in wet spots.

724-743/W Lettia soils and Selmac sandy loam association, 10 to 35 percent slopes. 1293 acres. The deep well-drained Lettia soils are on the smooth sideslopes and convex postions. Selmac soils are somewhat poorly drained. They are at the base of long slopes just above stream bottoms. Lettia soils occupy about 60 percent of the unit. Selmac soils make up about 40 percent of the area. Inclusions of Holland soils occur on steep sideslopes.

VENA SERIES (731)

The Vena series consists of moderately deep, loamy, very gravelly, well-drained soils from volcanic rocks in areas receiving more than 35 inches of precipitation. They occur on steep to very steep slopes.

Profile Description: Vena gravelly loam

Surface Soil:	0-8"	Dark reddish brown, gravelly loam, friable, slightly acid, (6 to 10 inches thick).
Subsoil:	8-30"	Yellowish red, very gravelly light clay loam, friable, medium acid, (10 to 30 inches thick).
Substrata:	30"+	Fractured volcanic rock.
Representative Profile:	The site is located near the junction of the 30-2-2.0 and 30-2-3.2 roads in the SW¼, SE¼, Sec. 3, T. 30 S., R. 2 W.	

Variations: Depth to bedrock ranges from 20 to 40 inches. Coarse fragment content ranges from 35 to 75 percent. Surface soil colors are dark reddish brown, reddish brown, or brown. Subsoil colors are reddish brown, yellowish red, strong brown, or red. Textures of the surface layer are gravelly loam or very gravelly loam. Textures of the subsurface are very gravelly loam or very gravelly light clay loam.

Setting: The Vena soils occur on steep to very steep mountainous slopes at elevations of 2000 to 4000 feet. Areas below 2500 feet are generally on north facing slopes. Slope gradients range from 35 to 85 percent. The soils formed in colluvium from basic volcanic rocks. The Vena soils are common in the Elk Creek and Trail Creek watersheds.

The summers are warm and dry and the winters are cool and moist. The mean annual precipitation ranges from 35 to 60 inches. The mean annual air temperature ranges from 47° to 52° F., the mean January temperature centers on 35° F., and the mean July temperature centers on 68° F. The frost-free period ranges from 100 to 150 days. Native vegetation consists of Douglas-fir, ponderosa pine, incense cedar, madrone and an understory of shrubs and forbs.

The Vena soils are associated with soils of the shallow, very gravelly Shippa series; the deep, very gravelly Chamate series; and the deep, red, clayey Freezner series. The Vena soils are distinguished from the similar Beekman soils, which are from metamorphic and sedimentary rocks, by being redder in color and lower in organic matter in the surface layer.

Soil Behavior and Recommendations:

Vena soils support stands of Douglas-fir, incense cedar and ponderosa pine. Average site index is 110 for northerly aspects and 110 for southerly aspects.

The soil has a low water-holding capacity. The high amount of coarse fragments, the loam texture, and the low amount of organic matter produce a water holding capacity that is between 1.5 and 2.0 inches. This amount of moisture is adequate for survival of Douglas-fir bare-root seedlings in clearcuts on northerly aspects. On steep southerly aspects there is not. Recommendation is to use strip cuts or small clearcuts because herbicides are necessary to control invading vegetation such as grasses and poison oak. Artificial shading is also recommended.

Most of the Vena soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally, tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Vena soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Broadcast, hot, slash burning does cause erosion on Vena soils when they occur on 70 percent southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder to get seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn these soils.

Burning slash does not produce a significant increase in erosion on northerly aspects through volatilization and runoff. Recommendation is to spot burn where possible.

Road construction requires ripping and blasting. The material below the soil is usually moderately hard volcanic rocks. Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out on sideslopes with gradients over 80 percent.

Road construction can cause severe erosion on Vena soils when they are on sideslopes over 80 percent or in draws with slopes over 75 percent. When sidecast becomes saturated, it overloads the soil below it and triggers large debris avalanches. Recommendations are:

1. Avoid building roads in these soils.

2. If roads must be built, then roll the grade, keep them narrow, and end haul. Local experience has shown that doing these items substantially reduced debris avalanches. Particular attention needs to be given to the way the pioneer road is constructed. In some very steep segments, no pioneer is recommended. In other areas where a pioneer road can be used, a small cat with a U-shaped blade is recommended. Figure 32 shows a berm that is helpful to prevent sidecast from being lost over the side.

Selection of disposal sites requires as much care as does the location and construction of the road.

Sidecast from Vena soil on slopes less than 70 percent is normally stable. Sidecast does not respond well to seeding and mulching. There are very few fines. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Mapping Units:

731-362/WX	Vena gravelly loam - Chamate gravelly loam association, 10 to 65 percent slopes. 1320 acres. This association contains about 60 percent Vena soils and about 40 percent Chamate soils. Vena soils are on the steep portions of the unit. Chamate occurs at the base of long slopes and in draws. About 70 percent of the slopes have gradients between 10 and 35 percent. Inclusions of Shippa soils occur mingled with Vena soils. Also Freezner soils occur on gentle benches.
731-732/V	Vena gravelly loam - Shippa very gravelly loam association, 0 to 10 percent slopes. 281 acres. This association contains about 80 percent moderately deep Vena soils and about 20 percent shallow Shippa soils. They occur on a nearly level bench in a random manner. Inclusions of Chamate and Freezner soils occur at random.
731-732/X	Vena gravelly loam - Shippa very gravelly loam association, 35 to 65 percent slopes. 1817 acres. This association contains about 70 percent moderately deep Vena soils and about 30 percent shallow Shippa soils. Vena soils are on sideslopes, ridgetops, and lower portions of slopes. Shippa soils are on the steep portions of the unit and are mingled with Vena soils. Inclusions of Chamate and Freezner soils occur at random.

731-732/Y — Vena gravelly loam - Shippa very gravelly loam association, 65 to 90 percent slopes. 8439 acres. This association contains about 60 percent moderately deep Vena soils and about 40 percent shallow Shippa soils. Vena soils are on sideslopes, ridgetops, and lower portions of slopes. Shippa soils are on the steep portions of the unit and are mingled with Vena soils. Inclusions of Chamate and rock land occur at random.

731-732-R/Y — Vena gravelly loam - Shippa very gravelly loam - Rock land association, 65 to 90 percent slopes. 818 acres. This association contains about 50 percent moderately deep Vena soils, 30 percent shallow Shippa soils, and 20 percent rock land. Vena soils are on sideslopes, ridgetops, and toe slopes. Shippa soils are on the steep portions of the unit. Rock land occurs near the ridgetops and in headwalls. Inclusions of Chamate soils occur in draws.

SHIPPA SERIES (732)

The Shippa series consists of shallow, very gravelly, well-drained soils from volcanic rocks in areas receiving more than 35 inches of precipitation. They occur on steep to very steep slopes.

Profile Description: Shippa very gravelly loam

Surface Soil:	0-4"	Brown, very gravelly loam, friable, moderately acid, (2 to 6 inches thick).
Subsoil:	4-16"	Reddish brown, very gravelly loam, friable, moderately acid, (8 to 18 inches thick).
Substrata:	16"+	Fractured rock.
Representative Profile:	Sec. 13, T. 27 S., R. 3 W., at the end of the 27-3-13.1 road.	

Variations: Depth to bedrock ranges from 12 to 20 inches. Coarse fragment content ranges from 35 to 70 percent. Surface soil colors are brown or reddish brown. Subsoil colors are reddish brown, yellowish red, or strong brown. Textures of the surface and subsurface layers are very gravelly loam, very gravelly clay loam, or very gravelly silty clay loam.

Setting: Shippa soils occur on steep to very steep mountainous slopes at elevations of 2000 to 4000 feet. Slope gradients range from 35 to over 85 percent with most areas being steeper than 50 percent. The soils formed in colluvium from tuff, breccia and volcanic flow rocks.

The summers are warm and dry and the winters are cool and moist. Mean annual precipitation ranges from 35 to 55 inches. The mean annual air temperature ranges from 47° to 52° F., the mean January temperature centers on 35° F., and the mean July temperature centers on 68° F. The frost-free period ranges from 100 to 150 days. Vegetation is Douglas-fir, ponderosa pine, madrone, incense cedar and understory or shrubs and forbs.

Shippa soils are associated with the moderately deep, very gravelly Vena soils; the deep, red, clayey Freezner soils; and rock land.

Soil Behavior and Recommendations:

Shippa soils support stands of scattered Douglas-fir. Average site index is 95 for northerly aspects and 75 for southerly aspects.

The soil has a low water-holding capacity. The high amount of coarse fragments, the loam texture, and the low amount of organic matter produce a water holding capacity that is between 0.5 and 1.0. This amount of moisture is not adequate for the survival of bare-root Douglas-fir seedlings in clearcuts. These soils are very difficult to reforest. Clearcutting is not recommended for any aspect.

On southerly aspects, reforestation is difficult. It frequently takes more than five years using the present techniques. On northerly aspects regeneration time is shorter but is still difficult.

The stand density on these soils is below normal. The water holding capacity is not enough to support normally stocked stands. The production of these soils is accordingly low. Recommendations are:

1. For steep southerly aspects with high coarse fragment content, remove them from the allowable cut base.

2. For northerly aspects and gentler southerly aspects with low coarse fragment content, use partial cutting on narrow strip cuts.

3. Identify the acres of these soils and reduce the volume per acre that normal yield tables say will be produced. Frequently these soils produce about 60 percent of normal production.

Most of the Shippa soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally, tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Shippa soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Broadcast, hot, slash burning does cause erosion on Shippa soils when they occur on 70 percent southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder to get seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn these soils.

Road construction requires mostly blasting. The material below the soil is usually hard volcanic rocks. Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out on slopes over 80 percent.

Road construction can cause severe erosion on Shippa soils when they are on sideslopes over 80 percent or in draws with slopes over 75 percent. When sidecast becomes saturated, it overloads the soil below it and triggers large debris avalanches. Recommendations are:

1. Avoid building roads in these soils.

2. If roads must be built, then roll the grade, keep them narrow, and end haul. Local experience has shown that doing these items substantially reduced debris avalanches. Particular attention needs to be given to the way the pioneer road is constructed. In some very steep segments no pioneer is recommended. In other areas where a pioneer road can be used, a small cat with a U-shaped blade is recommended. Figure 32 shows a berm that is helpful to prevent sidecast from being lost over the side.

Sidecast from Shippa soil on slopes less than 80 percent is normally stable. Sidecast does not respond well to seeding and mulching. There are very few fines. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Mapping Units:

732-362/Y	Shippa very gravelly loam - Chamate very gravelly loam association, 65 to 90 percent slopes. 2430 acres. This association contains about 70 percent shallow Shippa soils and 30 percent deep Chamate soils. The Shippa soils occur on the convex slopes while the Chamate soils occur on the gentler topography and in draws. Inclusions of Vena soils and rock land occur at random.

FREEZNER SERIES (741)

The Freezner series consists of deep, clayey, red, well-drained soils from basic volcanic rocks in areas receiving more than 35 inches of precipitation. They occur on moderately steep to very steep mountainous slopes.

Profile Description: Freezner loam

Surface Soil:	0-10"	Dark reddish brown loam, friable, slightly acid, (7 to 15 inches thick).
Subsoil:	10-55"	Yellowish red clay, firm, sticky, plastic, slightly acid, (33 to 45 inches thick).
Substrata:	55"+	Fractured volcanic bedrock.
Representative Profile:	The site is located on the 29-2-4.1 road just off north line of Sec. 22, in the SW¼, SE¼, Sec. 15, T. 29 S., R. 2 W.	

Variations: Depth to bedrock ranges from 40 to 60+ inches. Coarse fragment content ranges from 0 to 35 percent and may exceed 35 percent below 40 inches. Surface soils colors are reddish brown, dark reddish brown, or dark brown. Subsoil colors are reddish brown, red, yellowish red, or reddish yellow. Surface soil textures are loam, gravelly loam, clay loam or gravelly clay loam. Subsoil textures are clay, gravelly clay, clay loam, or gravelly clay loam. Soil reaction becomes more acid with depth but never exceeds medium acidity below 60 inches.

Setting: The Freezner soils occur on ridgetops and mountainous side-slopes at elevations between 2000 and 4000 feet. Slope gradients range from 10 to 85 percent, but commonly are between 10 and 65 percent. The soils formed in colluvium from basic volcanic rocks.

The summers are warm and dry and the winters are cool and moist. Mean annual precipitation ranges from 35 to 60 inches. The mean annual air temperature ranges from 47° to 52° F., the mean January temperature centers on 34° F., and the mean July temperature centers on 65° F. The frost-free period ranges from 120 to 150 days. Native vegetation consists of Douglas-fir, sugar pine, ponderosa pine, incense cedar and an associated understory of shrubs and forbs.

The Freezner soils are associated with the moderately deep, very gravelly, loamy Vena soils; and the shallow, very gravelly, loamy Shippa soils. Small areas of moderately well-drained Selmac soils occur with Freezner soils.

Soil Behavior and Recommendations:

Freezner soils support productive stands of Douglas-fir with ponderosa pine, sugar pine and incense cedar. The average site index is 135 for northerly aspects and 130 for southerly aspects. The stand density is usually normal for Douglas-fir.

Clearcutting is the recommended harvesting practice for Freezner soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not normally a problem on northerly aspects. Occasionally dense stands of Ceanothus integerrimus will get established. However, on southerly aspects, grasses, Ceanothus integerrimus and poison oak are a problem. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing and low elevation northerly units for 1 to 3 years following planting. Units should be planted the first winter following logging. This helps get the trees established before the unit is invaded with pioneering vegetation.

Freezner soils are high in clay content. They compact easily from tractor logging. In areas where Freezner is underlain by soft tuffs and breccias the soil does not dry out very much in the summer. For these areas cable logging is recommended. In areas where Freezner is underlain by harder bedrock such as andesite or basalt, tractor logging is an acceptable method of yarding provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally, tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart, during the driest time of the year.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water barred.

The upper 20 inches of Freezner soils have a high water holding capacity. The low amount of coarse fragments, the clay loam texture of the surface soil plus the clay texture of the upper part of the subsoil, and the moderate amount of organic matter all blend together to produce a water holding capacity that is between 3.0 and 4.0 inches. This amount of moisture is adequate for survival of bare-root Douglas-fir seedlings in clearcuts. The success of bare-root Douglas-fir seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading is not needed on Freezner soils.

Burning slash does not produce a significant increase in erosion on Freezner soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendations are to spot burn wherever possible.

At higher elevations and on north facing units, Freezner soils will support stands of Ceanothus velutinus (slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in Freezner soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Freezner soils. The material below the soil is usually ripable tuffs, breccias, andesites or basalts. Cut bank stability is high on slopes less than 40 percent and low on slopes over 40 percent. The most common failures are half-moon shaped slumps from the cut bank. They are usually small. Occasionally a fill made of Freezner will fail. Overall, Freezner is a stable soil for road building.

Freezner soils commonly occur on gentle, old landslide topography that has benches and short steep slopes. Frequently the benches are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the backslopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended.

Sidecast from Freezner soils on slopes less than 50 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Freezner soils is necessary for winter hauling. Either rocking or seeding, mulching, and blocking off temporary spurs is recommended.

Freezner soils are well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 12 inches of compacted subsoil is adequate.

Fire trails built by hand have the least impact on the soil. If tractors must be used, build closely spaced water bars.

Sediment that is produced from Freezner soils over tuffs stays in suspension for long periods of time. For maintaining water quality, recommendations are to mulch all skid trails, mulch, seed, fertilize cut banks and fill slopes.

Mapping Units:

741-362/WV	Freezner loam - Chamate gravelly loam association, 0 to 35 percent slopes. 2926 acres. This unit contains 60 percent deep, clayey Freezner soils, 20 percent deep, skeletal Chamate soils, and 20 percent inclusions of unnamed deep, gravelly poorly-drained soils and deep, clayey, poorly-drained soils. The Freezner occurs on the gentle parts of the unit. The Chamate occurs at random. About 70 percent of the slopes have gradients between 10 and 35 percent.
741-362/W	Freezner loam - Chamate gravelly loam association, 10 to 35 percent slopes. 6929 acres. This unit contains 60 percent deep, clayey Freezner soils, 20 percent deep, skeletal Chamate soils, and 20 percent inclusions of unnamed deep, gravelly poorly-drained soils and deep, clayey, poorly-drained soils. The Freezner occurs on the gentle parts of the unit. The Chamate occurs at random.
741-362/X	Freezner loam - Chamate gravelly loam association, 10 to 65 percent slopes. 2310 acres. This unit contains 50 percent deep, clayey Freezner soils, 30 percent deep, skeletal Chamate soils, and 20 percent inclusions of unnamed deep gravelly, poorly-drained soils and deep, clayey, poorly-drained soils. The Freezner occurs on the gentle parts of the unit. The Chamate occurs at random.
741-731/W	Freezner loam - Vena gravelly loam association, 10 to 35 percent slopes. 1146 acres. This unit contains about 60 percent of the deep, clayey Freezner soils and about 40 percent of the moderately deep, loamy Vena soils. The Vena soils are on the steeper slope positions. Inclusions of the shallow Shippa soils are mingled with the Vena soils. The deep Chamate soils occur at random through the unit.

741-731/WX — Freezner loam - Vena gravelly loam association, 10 to 65 percent slopes. 3205 acres. This unit contains about 60 percent of the deep, clayey Freezner soils and about 40 percent of the moderately deep, loamy-skeletal Vena soils. The Vena soils are on the steeper slope positions. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Inclusions of the shallow Shippa soils are mingled with the Vena soils. The deep Chamate soils occur at random through the unit.

741-731/WXn — Freezner loam - Vena gravelly loam association, 10 to 65 percent slopes, northerly aspect. 1073 acres. This unit contains about 60 percent of the deep, clayey Freezner soils and about 40 percent of the moderately deep, loamy-skeletal Vena soils. The Vena soils are on the steeper slope positions. About 70 percent of the slopes have gradients between 10 and 35 percent, and about 30 percent have gradients between 35 and 65 percent. Inclusions of the shallow Shippa soils are mingled with the Vena soils. The deep Chamate soils occur at random through the unit.

741-731/X — Freezner loam - Vena gravelly loam association, 35 to 65 percent slopes. 2716 acres. The unit contains about 60 percent of the deep, clayey Freezner soils and about 40 percent of the moderately deep, loamy-skeletal Vena soils. The Vena soils are on the steeper slope positions. Inclusions of the shallow Shippa soils are mingled with the Vena soils. The deep Chamate soils occur at random through the unit.

741-731-743/W — Freezner loam - Vena gravelly loam - Selmac sandy loam association, 10 to 35 percent slopes. 4148 acres. This association contains about 50 percent Freezner soils, 30 percent Vena soils and 20 percent Selmac soils. Freezner soils occur on the gentle parts of the unit. Vena soils occupy the steep parts. Selmac soils are found in small wet spots. These wet spots are usually the sag ponds of old slumps. Inclusions of Shippa soils occur with Vena.

SELMAC SERIES (743)

The Selmac series consists of deep, brown, moderately well drained, clay loam overlying massive heavy clay soils that occur on very gentle topography underlain by metavolcanic and volcanic rocks.

Profile Description: Selmac sandy loam

Surface Soil:	0-11"	Yellowish brown, sandy loam, friable, strongly acid, (5 to 14 inches thick).
Subsoil:	11-31"	Strong brown, sandy loam, firm, strongly acid, (12 to 28 inches thick).
Substrata:	31-45"+	Massive, mottled heavy clay.
Representative Profile:	Just off 28-3-33.0 road in SE¼, SE¼, Sec. 28, T. 28 S., R. 3 W.	

Variations: The thickness of the solum above the unconforming clayey horizon ranges from 12 to 35 inches. The total soil depth ranges from 40 to 60 inches to highly weathered sediments. The surface soil colors are dark brown, brown, or dark yellowish brown. Surface soil textures are loam, clay loam or sandy loam, with 5 to 20 percent coarse fragments. The subsoil colors are strong brown, dark yellowish brown and dark grayish brown. Subsoil textures are sandy clay loam, clay loam or gravelly clay loam.

Setting: The Selmac soils occur on nearly level to gently sloping drainage basins with gradients of 2 to 12 percent and at elevations of 800 to 400 feet. It is forming in stratified loamy and clayey mixed alluvium. The climate is characterized by warm, dry summers and cool, moist winters, with an annual precipitation of 30 to 55 inches. The mean annaul temperature is 52° to 54° F., the average January temperature is 39° F., and the average July temperature is 70° F. The frost-free season is 140 to 170 days. The native vegetation consists of Douglas-fir, ponderosa pine, black oak, madrone, poison oak, and grasses.

The Selmac soils are associated with the Abegg and Pollard soils, both lacking contrasting textures. Pollard soils have clayey argillic horizons. Abegg soils are skeletal.

Soil Behavior and Recommendations:

Selmac soils support productive stands of predominantly Douglas-fir with western red cedar, incense cedar and alder. The average site index is not available for northerly aspects and 85 for southerly aspects. The stand density is usually normal for Douglas-fir.

Clearcutting is the recommended harvesting practice for Selmac soils. Partial cutting encourages the establishment and growth of grasses and other pioneering vegetation. The influx of these species compete with young Douglas-fir seedlings for moisture. Controlling the competing vegetation is difficult at this point in time in a partial cut because aerially applied herbicides do not penetrate the canopy.

Competition from grass and other species is not a problem on northerly aspects. However, on southerly aspects it is. The recommended practice is to clearcut both aspects but apply herbicides to southerly facing units for 1 to 2 years following planting. Units should be planted the first winter following logging. This helps get the trees established before the unit is invaded with pioneering vegetation.

Selmac soils are high in clay content and also have a high water table. They compact very easily from tractor logging. Cable logging is recommended for these soils.

The upper 20 inches of Selmac soils have a high water holding capacity. The low amount of coarse fragments, the sandy loam or clay loam texture of the surface soil plus the clay loam or clay textures of the upper part of the subsoil, and the moderate amount of organic matter all blend together to produce a water holding capacity that is between 3.0 and 3.5 inches. This amount of moisture is adequate for the survival of bare-root ponderosa pine seedlings in clearcuts. The success of bare-root ponderosa pine seedlings is high on northerly aspects. On southerly aspects competing vegetation is a problem. However, if herbicides are used successfully, the survival of seedlings will be high. Shading is not needed on Selmac soils.

Ponderosa pine is recommended for Selmac because of its ability to grow in wet clay subsoils.

Burning slash does not produce a significant increase in erosion on Selmac soils. Losses of inorganic potassium and phosphorous do not appear to be significant. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. Recommendation is to spot burn where possible.

Selmac soils will support stands of Ceanothus velutinus (Slickleaf, varnish leaf, snowbrush). This species fixes nitrogen, provides browse for big game, and increases survival of Douglas-fir seedlings. Over a 10-year period this plant can produce 300 to 600 pounds of nitrogen per acre. Recommendation is to seed units in Selmac soils lightly with this species. A density of 600 ceanothus plants per acre is optimum. After a 10-year period the brush can be sprayed with a herbicide to favor Douglas-fir.

Road construction is generally easy in Selmac soils. The material below the soil is usually soft, highly weathered volcanic or granitic colluvium. Cut bank stability is high on slopes less than 20 percent and low on slopes over 20 percent. The most common failure is the cut banks sliding slowly into the road. If cuts are deeper than 10 feet and backslopes are less than 50 percent, Selmac soils should be rip rapped.

Selmac soils commonly occur on gentle, old landslide topography. Frequently it is on benches that are rotational slumps. Road location through this type of topography must be done with care. The most stable location for a road that has to go near a rotational slump is on top and toward the outer edge. This prevents cutting into the toe of the slump which would reduce its support. If a road must be built through the toe of a rotational slump and the backslopes are less than 50 percent, then use a blanket of rip rap on the cut bank. Success of rip rap on slopes over 50 percent is very poor and is not recommended

Sidecast from Selmac soils on slopes less than 30 percent is normally stable. Both cut banks and sidecast respond well to seeding and mulching. Clayey sediment from new road construction can be expected for 1 to 2 years after construction. Sediment reaching a stream will be fine textured and will discolor the water. It is easily suspended in runoff water. Rocking roads in Selmac soils is necessary for winter hauling. Either rocking or seeding, mulching and blocking off temporary spurs is recommended.

Selmac soils are well suited for helipond locations and material to construct small earth dams. The material compacts easily when at optimum moisture. The subsoil is well suited to be used as a sealer for pond bottoms. Usually 6 to 12 inches of compacted subsoil is adequate.

Fire trails built by hand have the least impact on the soil. If tractors must be used, build closely spaced water bars.

Mapping Units: Selmac soils are minor in extent. They are a secondary soil associated with Freezner and Lettia soils.

PEARSOLL SERIES (770)

The Pearsoll series consists of shallow, reddish brown, very gravelly, xeric soils derived from ultramafic rocks, mostly serpentine. These soils have a gravelly clay loam topsoil and a gravelly silty clay subsoil. These soils are found on sideslopes with slope gradients from 50 to greater than 90 percent.

Profile Description: Pearsoll clay loam

Surface Soil:	0-4"	Dark brown gravelly clay loam, friable, slightly acid, (2 to 6 inches thick).
Subsoil:	4-18"	Reddish brown very gravelly clay, firm, very sticky, very plastic, medium acid, (6 to 18 inches thick).
Substrata:	18"+	Fractured serpentinitic bedrock.

Representative Profile: NW¼, SE¼, Sec. 17, T. 30 S., R. 6 W., on Hanna Nickle Co. road.

Variations: Depth to bedrock ranges from 12 to 20 inches. Coarse fragment content ranges from 35 to 75 percent. Surface soil colors are dark reddish brown, or dark brown. Subsoil colors are reddish brown, yellowish red, or strong brown. Surface textures are gravelly clay loam or very gravelly clay loam. Subsoil textures are very gravelly clay or very gravelly silty clay.

Setting: The Pearsoll soils occur on moderately steep to very steep slopes in the Siskiyou Mountains at elevations of 600 to 2500 feet. Slope gradients range from 10 to 85 percent. They formed in colluvium from serpentinitic rocks.

The winters are cool and moist and the summers are warm and dry. The mean annual precipitation ranges from 25 to 60 inches. The mean annual air temperature ranges from 47° to 54° F., the mean January temperature centers on 34° F., and the mean July temperature centers on 66° F. The frost-free period ranges from 100 to 160 days. The native vegetation consists of Jeffrey pine, knobcone pine, chinquapin and incense cedar with an understory of grasses and ceanothus (C. uniatus and C. condulatus) (see Figure 43).

The Pearsoll soils are associated with rock land as well as minor inclusions of loamy, shallow soils; very gravelly, moderately deep, clayey soils; moderately well-drained, clayey soils; and very gravelly, deep, loamy soils from serpentine that have not been classified by soils series.

Figure 43. Vegetation on Pearsoll soils consists mainly of wedge leaf ceanothus, grasses, Jeffrey pine and Incense cedar.

Soil Behavior and Recommendations:

Pearsoll soils support stands of very scattered Jeffrey pine with a ground cover of grasses and wedge leaf ceanothus. Average site index for Jeffery pine growing in this soil is 80 for both northerly and southerly aspects.

The soil has a low water holding capacity. The high amount of coarse fragments, the clay texture, and the low amount of organic matter produce a water holding capacity that is between 1.0 and 1.5.

This serpentine soil is similar to other serpentine soils in southern Oregon and northern California. It has a very low productivity. Various researchers have advanced reasons why serpentine soils produce poor growth. Most of them recognize more than one factor. Some of the most common factors are:

1. Poor physical characteristics (poor structure, high gravel content).

2. Low levels of available molybdenum soil micro-organisms and nitrogen, phosphorous and potassium.

3. High amounts of available micronutrients.

4. High amounts of magnesium.

Poor physical characteristics affect the water holding capacity. The remaining factors affect the fertility. Pearsoll soils have a high concentration of magnesium and iron ions. There is more magnesium than calcium which is opposite from nonserpentine soils in this area. The reverse of Mg and Ca content apparently causes a toxicity to Douglas-fir.

Douglas fir seedlings die in this soil. Jeffrey pine survival is better. Recommendations are:

1. Remove acres of this soil from the allowable cut land base.

2. Manage them as natural areas and wildlife habitat.

Pearsoll soils are poorly suited for helipond locations because the material below them is fractured porous bedrock. They are poorly suited for material to construct small dams because of a high stone content.

Road construction required ripping and blasting. The material below the soil is hard serpentine. Cut bank stability is high on this soil. Road failures are minimal.

Cut banks do not respond to seeding and mulching. Sidecast does. Recommend seeding, mulching and fertilizing sidecast with a specie that is tolerant of high pH and high iron content.

Mapping Units:

770-771/W	Pearsoll gravelly clay loam - Cornutt gravelly clay loam association, 10 to 35 percent slopes. 265 acres. This unit contains about 50 percent shallow Pearsoll soils and 30 percent moderately deep Cornutt soils. The remaining 20 percent are inclusions of deep black unnamed serpentinitic soils. Some of the black soils are poorly drained. Pearsoll soils occur with Cornutt soils in a random fashion. The Pearsoll tends to be on steeper slopes.
770-771/X	Pearsoll gravelly clay loam - Cornutt gravelly clay loam association, 35 to 65 percent slopes. 1552 acres. This unit contains about 60 percent shallow Pearsoll soils and 30 percent moderately deep Cornutt soils. The remaining 10 percent are inclusions of deep black unnamed serpentinitic soils. Some of the black soils are poorly drained. Pearsoll soils occur with Cornutt soils in a random fashion. The Pearsoll tends to be on steeper slopes.
770-771/Y	Pearsoll gravelly clay loam - Cornutt gravelly clay loam association, 65 to 90 percent slopes. 7184 acres. This unit contains about 70 percent shallow Pearsoll soils and 20 percent moderately deep Cornutt soils. The remaining 10 percent are inclusions of deep black unnamed serpentinitic soils. Some of the black soils are poorly drained. Pearsoll soils occur with Cornutt soils in a random fashion. The Pearsoll tends to be on steeper slopes. Also, there are areas of rock land in this unit.
770-R/Y	Pearsoll gravelly clay loam - Rock land association, 65 to 90 percent slopes. 1189 acres. This unit contains about 70 percent Pearsoll soils and 30 percent rock land. Predicting where these soils occur in the mapping unit is impossible. Inclusions of Cornutt soils and a moderately deep, black, clayey, unnamed soil occur with the Pearsoll soils.

CORNUTT SERIES (771)

The Conutt series consists of moderately deep, red, gravelly clay, xeric soils derived from ultramafic rocks, mostly serpentine. These soils have a gravelly clay loam topsoil and a gravelly clay subsoil. These soils are found on gently sloping topography such as slumps, broad ridgetops and sideslopes with slope gradients from 25 to 50 percent.

Profile Description: Cornutt gravelly clay loam

Surface soil:	0-3"	Dark reddish brown, gravelly clay loam, friable, neutral, (2 to 6 inches thick).
Subsoil:	3-25"	Dark red gravelly clay, firm, neutral, (14 to 18 inches thick).
Substrata:	25"+	Highly weathered and fractured serpentinitic bedrock.

Representative Profile: 24-4-15.0 road in the SW¼, NE¼, Sec. 15, T. 28 S., R. 4 W.

Variations: Depth to bedrock ranges from 20 to 40 inches. The coarse fragment content ranges from 15 to 30 percent gravel or cobbles. Surface colors are dark reddish brown, reddish brown, or yellowish red. Surface textures are very gravelly clay loam and gravelly clay loam. Subsoil colors are reddish brown, yellowish red, and dark red. Subsoil textures are gravelly clay or gravelly silty clay.

Setting: The Cornutt soils occur on moderately steep to steep mountain slopes, alluvial fans or high stream terraces with slopes of 1 to 60 percent at elevations of 800 to 5000 feet. The soils are forming in colluvium or alluvium weathered from serpentine or peridotite rocks. The climate is characterized by cool, moist winters and warm, dry summers, with an annual precipitation of 30 to 60 inches. The mean annual temperature is 45° to 55° F., and the frost-free season is 130 to 160 days. The native vegetation consists of an overstory of Jeffrey pine, knobcone pine, ponderosa pine, chinquapin, and incense cedar. The understory consists mainly of grasses and ceanothus (*C. curiatus* and *C. cordulata*).

The Cornutt soils are associated primarily with Pearsoll soils. The Pearsoll soils are shallow skeletal, and do not have an argillic horizon. In a few areas they are associated with rock land.

Soil Behavior and Recommendations:

Cornutt soils support stands of scattered Jeffrey pine with some stunted incense cedar and ponderosa pine. Average site index for Jeffrey pine growing in this soil is 110 for both northerly and southerly aspects.

The soil has a moderate to low water holding capacity. The high amount of coarse fragments, the clay texture, and the low amount of organic matter produce a water holding capacity that is between 1.5 and 2.5 inches.

This serpentine soil is similar to other serpentine soils in southern Oregon and northern California. It has a very low productivity. Various researchers have advanced reasons why serpentine soils produce poor growth. Most of them recognize more than one factor. Some of the most common factors are:

1. Poor physical characteristics (poor structure, high gravel content).

2. Low levels of available molybdenum soil micro-organisms, and nitrogen, phosphorous, and potassium.

3. High amounts of available micronutrients.

4. High amounts of magnesium.

Poor physical characteristics affect the water holding capacity. The remaining factors affect the fertility. Cornutt soils have a high concentration of magnesium and iron ions. There is more magnesium than calcium, a situation opposite to nonserpentine soils in this area. The reverse of Mg and Ca content apparently causes a toxicity to Douglas-fir.

Douglas fir seedlings die in this soil. Jeffrey pine survival is better. Recommendations are:

1. Recognize the low productivity in the allowable cut base. These soils frequently have a lower than normal stocking level.

2. Make sanitary cuts (removing dead and dying trees).

Cornutt soils are poorly suited for helipond locations because the material below them is fractured porous bedrock. They are poorly suited for material to construct small dams because of a high stone content.

Road construction requires ripping and blasting. The material below the soil is hard serpentine. Cut bank stability is high on these soils. Road failures are minimal.

Cut banks do not respond to seeding and mulching. Sidecast does. The recommendation is to seed, mulch, and fertilize sidecast with a specie that is tolerant of high pH and high iron content.

Most of the Cornutt soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils are high in clay content and are easily compacted. On areas that have slopes of less than 35 percent, these soils can safely be tractor-logged provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally, tractor logging can be done from June 1 to September 15.

2. All major skid trails be water barred.

Mapping Units:

771-770/W — Cornutt gravelly clay loam - Pearsoll gravelly clay loam association, 10 to 35 percent slopes. 2230 acres. This unit contains about 60 percent Cornutt soils and about 30 percent Pearsoll soils. Cornutt soils occur on gentle topography, ridgetops, and gentle sideslopes. Intermingled with the Cornutt are the shallow Pearsoll soils. About 10 percent of this unit is an unnamed, dark-colored, clayey soil that supports incense cedar and a few Douglas-fir.

771-770/X — Cornutt gravelly clay loam - Pearsoll gravelly clay loam association, 35 to 65 percent slopes. 641 acres. This unit contains about 60 percent Cornutt soils and about 30 percent Pearsoll soils. Cornutt soils occur on gentle topography, ridgetops, and gentle sideslopes. Intermingled with the Cornutt are the shallow Pearsoll soils. About 10 percent of this unit is an unnamed, dark-colored, clayey soil that supports incense cedar and a few Douglas-fir.

771-R/X — Cornutt gravelly clay loam - Rock land association, 35 to 65 percent slopes. 275 acres. This association contains about 60 percent moderately deep Cornutt soils, 20 percent rock land, and 20 percent inclusions. The Cornutt soils occur on ridgetops and in concave positions. Rock land is scattered through the unit. The inclusions are Pearsoll soils, and a deep, black clay soil.

771-R/Y	Cornutt gravelly clay loam - Rock land assoication, 65 to 90 percent slopes. 337 acres. This association contains about 50 percent moderately deep Cornutt soils, 30 percent rock land, and 20 percent inclusions. The Cornutt soils occur on ridgetops and are scattered through the unit. The inclusions are Pearsoll soils, and a deep, black, clay soil.

JAYAR SERIES (824)

The Jayar series consists of moderately deep, brown, gravelly loam soils from metamorphic rocks. They occur on ridgetops and steep sideslopes at elevations above 3200 feet.

Profile Description: Jayar very gravelly loam

Surface Soil:	0-10"	Very dark grayish brown, very gravelly loam, friable, medium acid, (6 to 9 inches thick).
Subsoil:	10-36"	Dark brown, very gravelly clay loam, friable, medium acid, (10 to 30 inches thick).
Substrata:	36"+	Moderately hard, highly fractured, metamorphic bedrock.
Representative Profile:	Near junction of 31-8-3 and 31-8-8.1 roads in the NW¼, NW¼, Sec. 17, T. 31 S., R. 8 W.	

Variations: Solum thickness ranges from 20 to 40 inches. Coarse fragment content ranges from 35 to 50 percent. Surface soil colors are very dark brown, very dark grayish brown, or dark brown. Surface soil textures are very gravelly loam, gravelly loam or loam. Subsoil colors are dark brown, brown, or reddish brown. Subsoil textures are very gravelly loam, very gravelly clay loam, or gravelly clay loam.

Setting: The Jayar soils occur on steep to very steep slopes at elevations of 3500 to 5000 feet. Slope gradients range from 35 to 75 percent. The regolith consists of moderately fine textured gravelly colluvium from metamorphic, sedimentary and volcanic rocks. The climate is characterized by cool, dry summers and cold, moist winters, with an annual precipitation of 30 to 50 inches. The mean annual temperature is about 46° to 48° F. The soils are dry for more than 45 consecutive days and have annual soil temperatures less than 47° F. The native vegetation is Douglas-fir, chinquapin, hemlock, and rhododendron.

Jayar soils are associated primarily with Skymor. The Skymor soils are less than 20 inches deep.

Soil Behavior and Recommendations:

Jayar soils support stands of predominantly Douglas-fir with chinquapin and hemlock. Average site index is 115 for northerly aspects and 100 for southerly aspects.

The upper 20 inches of Jayar soils have a moderate water-holding capacity. The moderate amount of coarse fragment, the clay loam texture, and the low amount of organic matter blend to produce a water-holding capacity that is between 2.5 and 3.0 inches. This amount of moisture is adequate for the survival of Douglas-fir bare-root seedlings in clearcuts. The success of bare-root Douglas-fir is high on northerly and southerly aspects in recent clearcuts provided rhododendrons are eradicated.

Burning slash does not produce a significant increase in erosion on northerly aspects. Losses of inorganic potassium and phosphorous do not appear to be significant. There are substantial losses of nitrogen, organic phosphorous and sulfur through volatilization and runoff. Even though there is a loss of nitrogen, burning is recommended to get rid of rhododendrons.

Road construction requires ripping and some blasting. The material below the soil is usually moderately hard sandstone.

Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out on slopes over 80 percent. Recommendation is to end haul road segments that are over 80 percent.

Sidecast from Jayar soils on slopes less than 80 percent is normally stable. Sidecast responds well to seeding and mulching. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching. A species of grass that can grow in cool sites with short growing seasons is recommended.

Rocking roads is necessary for winter hauling.

Jayar soils are medium in clay content. They compact from tractor logging. Cable logging has the least impact on these soils. However, tractor logging is an acceptable method of yarding on Jayar soils provided the following precautions are followed:

1. Tractors are not allowed to operate during the wet season. Normally, tractor logging can be done from June 1 to September 15.

2. All skid trails and landings that are seriously compacted be ripped to a depth of 12 inches with teeth that are 12 to 15 inches apart.

3. Tractors are not allowed to operate on slopes over 35 percent.

4. All major skid trails be water-barred.

Jayar soils are moderately well suited for helipond locations because deep cuts in this soil get into porous material. They are well suited for material to construct small earth dams. A sealer of 6 to 10 inches of compacted red clay is recommended for heliponds built in this soil.

Mapping Units:

824-285/W — Jayar very gravelly loam - Skymor very gravelly loam association, 10 to 35 percent slopes. 312 acres. The unit contains about 70 percent Jayar soils and 30 percent Skymor soils. The Jayar soils occur on the gentle parts of the unit while the Skymor soils are on the steep sideslopes and headwalls. Inclusions of unnamed, deep, red, clayey soils occur throughout the unit.

824-825/Wn — Jayar very gravelly loam - Skymor very gravelly loam association, 10 to 35 percent slopes, northerly aspect. 498 acres. The unit contains about 70 percent Jayar soils and 30 percent Skymor soils. The Jayar soils occur on the gentle parts of the unit while the Skymor soils are on the steep sideslopes and headwalls. Inclusions of unnamed deep, red, clayey soils occur throughout the unit.

824-824/XY — Jayar very gravelly loam - Skymor very gravelly loam association, 35 to 90 percent slopes, southerly aspect. 981 acres. The unit contains about 50 percent Jayar soils and 40 percent Skymor soils and the remaining 10 percent inclusions. The Jayar soils occur on the gentle parts of the unit while the Skymor soils are on the steep sideslopes and headwalls. About 70 percent of the slopes have gradients between 35 and 65 percent, and about 30 percent have gradients between 65 and 90 percent. Inclusions of unnamed deep, red, clayey soils occur throughout the unit.

824-825/XYn — Jayar very gravelly loam - Skymor very gravelly loam association, 35 to 90 percent slopes, northerly aspects. 444 acres. The unit contains about 50 percent Jayar soils, 40 percent Skymor and 10 percent inclusions. The Jayar soils occur on the gentle parts of the unit while the Skymor soils are on the steep sideslopes and headwalls. Inclusions of unnamed, deep, red, clayey soils occur throughout the unit. About 70 percent of the slopes have gradients between 35 and 65 percent.

SKYMOR SERIES (825)

The Skymor series consists of shallow, brown, frigid, well-drained soils that are forming in colluvium from metasedimentary, metavolcanic, and sedimentary rocks. They occur on moderately steep to very steep mountainous topography receiving 30 to 50 inches of precipitation.

Profile Description: Skymor very gravelly loam

Surface Soil;	0-5"	Very dark brown, very gravelly loam, friable, medium acid, (4 to 6 inches thick).
Subsoil:	5-14"	Dark brown, very gravelly clay loam, friable, medium acid, (8 to 16 inches thick).
Substrata:	14"+	Hard, fractured metamorphic rock.

Representative Profile: Near junction of 31-8-3 and 31-8-8.1 roads in the NW¼, NW¼, Sec. 16, T. 31 S., R. 8 W.

Variations: Depth to a lithic contact varies from 12 to 20 inches. Changes in depth occur erratically over a span of a few feet. Coarse fragment content is 30 to 70 percent. The color of the surface soil is very dark brown to dark brown. The surface soil textures are very gravelly loam and gravelly loam. The subsoil colors are very dark brown, dark brown, and dark grayish brown. The subsoil textures are very gravelly loam or gravelly clay loam.

Setting: The Skymor soils occur on steep to very steep slopes of 35 to 90 percent at elevations of 3500 to 6000 feet. The regolith consists of medium textured gravelly colluvium from metamorphic and sedimentary rocks. The climate is characterized by cool, dry summers and cold, moist winters, with an annual precipitation of 30 to 50 inches. The soils are dry for more than 45 consecutive days and have annual soil temperatures less than 47° F. The mean annual air temperature is about 46° to 48° F. and the frost-free season is less than 110 days. Native vegetation is Douglas-fir, chinquapin, and Oregon grape.

Skymor soils are associated primarily with the Jayar soils, which are moderately deep.

Soil Behavior and Recommendations:

Skymor soils support stands of Douglas-fir and chinquapin. Average site index is 85 for northerly aspects and 80 for southerly aspects.

The soil has a low water holding capacity. The high amount of coarse fragments, the loam texture, and the low amount of organic matter produces a water holding capacity that is between 0.5 and 1.5 inches. This amount of moisture is not adequate for survival of bare-root Douglas-fir in clearcuts. These soils are very difficult to reforest. Clearcutting is not recommended for any aspect.

The stand density on these soils is below normal. The water holding capacity is not enough to support normally stocked stands. The production of these soils is accordingly low. Recommendations are:

1. For steep southerly aspects with high coarse fragment content, remove them from the allowable cut base.

2. For northerly aspects and gentler southerly aspects with low coarse fragment content, use partial cutting or narrow strip cuts.

3. Identify the acres of these soils and reduce the volume per acre that normal yield tables say will be produced. Frequently these soils produce about 60 percent of normal production.

Most of the Skymor soils occur on slopes too steep for tractor logging. Cable logging is recommended. Occasionally there are areas of this soil that are gentle enough for tractor yarding. These soils have a low clay content and are not easily compacted. On areas that have slopes less than 35 percent, these soils can safely be tractor logged provided the following precautions are used:

1. Tractors are not allowed to operate during the wet season. Normally, tractor logging can be done from June 1 to to September 15.

2. All major skid trails be water barred.

Skymor soils are poorly suited for helipond locations because they are porous and occur on steep slopes. They are poorly suited for material to construct small dams because of a low clay content and high stone content.

Broadcast, hot, slash burning does cause erosion on Skymor soils when they occur on 70 percent southerly aspects. Dry ravel during the summer months is significant. Hot burns deplete an already low organic matter content. Lowering the organic matter content lowers the water holding capacity which will cause the site to be harder to get seedlings to survive. There are significant losses of nitrogen, organic phosphorous and sulfur through volatilization and a small amount through runoff during the first rainy season after burning. It is recommended not to burn these soils.

Burning slash does not produce a significant increase in erosion on northerly aspects.

Road construction requires ripping and blasting. The material below the soil is usually hard sedimentary rocks. Cut bank stability is high on slopes less than 80 percent and low on slopes over 80 percent. The most common failure is sidecast sluicing out on slopes over 80 percent. Recommendation is to end haul road segments that are on slopes over 80 percent.

Sidecast from Skymor soil on slopes less than 80 percent is normally stable. Sidecast does not respond well to seeding and mulching. There are very few fines. Cut banks usually have a large amount of bedrock and are not worth seeding and mulching.

Mapping Units: Skymor soils are a secondary soil mapped with Jayar soils.

V. SOIL PROPERTIES AND QUALITIES

This section contains physical, chemical and engineering test data for many of the important soils in the Roseburg District. These data were used to arrive at ratings that appear in the section on Soil Use and Management (Section VI). They were also used to assist in the proper classification of the soils in the natural soil taxonomy system, and in the engineering classification systems.

Some of the analyses were done on soils sampled in the Roseburg District, and others were done on soils sampled outside the District. The source of the data for those soils sampled outside the District is given in the footnotes on the tables in this section.

A. Physical Properties

Table 11 shows physical data for selected soils. Percent soil material more than two millimeters in diameter was estimated to the nearest 5 percent by volume. Percent sand, silt, and clay were determined by the pipette method. Bulk density samples were obtained by the use of the Uhland core sampler. Moisture retention was determined by the pressure membrane method at 15 bar tensions, and with the pressure plate at 1/10 and 1/3 bar tensions.

B. Chemical Properties

Chemical laboratory data for selected soils is presented in Table 12. The pH was measured in a 1:1 water solution. Organic carbon was determined by the potassium dichromate oxidation method. Total nitrogen was determined by the Kjeldahl method. Calcium, magnesium, sodium, and potassium were determined by flame photometry. Cation exchange capacity was determined by the ammonium acetate method. Base saturation was determined by the sum of bases and the cation exchange capacity.

C. Engineering Properties and Classifications

Engineering tests were made to help evaluate the soils for engineering purposes. Table 13 contains engineering test data for some of the major soil series. The engineering classifications given are based on data obtained by mechanical analysis and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by the sieve and hydrometer method.

Moisture-density data are given for general guidelines for earthwork. If soil material is compacted at successively higher moisture content with compactive effort staying the same, the density of the compacted material increases until the optimum moisture content is reached. Beyond optimum moisture content, the density decreases. The additional water builds up pressure between soil particles preventing them from getting closer.

Table 11 - Physical Properties of Selected Soils

Soil Name Sample No. Location	Depth From Surface	Horizon	Coarse Fragments 2	Partial Size Distribution in Millimeters: Very Coarse Sand (2-1)	Coarse Sand (1-0.5)	Medium Sand (0.5-0.25)	Fine Sand (0.25-0.1)	Very Fine Sand (0.1-0.05)	Total Sand	Silt (.05-.002)	Clay (.002)	Textural Class	Bulk Density	Moisture Held At: 1/10 Bar	1/3 Bar	15 Bar
	Inches			%	%	%	%	%	%	%	%		g/cc	%	%	%
*Blachly Clay Loam (10) Sec. 22, T15S, R8W N½,SW¼,SE¼,NW¼.	0-9	A1	5	-	-	-	-	-	27.6	39.5	33.1	clay loam	.7	59.4	-	26.3
	9-20	B11	0	-	-	-	-	-	15.5	28.1	54.9	clay	-	-	-	-
	20-31	B12	0	-	-	-	-	-	14.8	26.4	58.7	clay	-	-	-	-
	31-44	B21	0	-	-	-	-	-	14.8	22.4	64.6	clay	1.0	42.9	-	25.3
	44-53	B22	0	-	-	-	-	-	13.9	22.8	63.2	clay	-	-	-	-
	53-78	B23	0	-	-	-	-	-	16.1	20.6	63.1	clay	1.2	37.6	-	25.0
	78-94	B3	0	-	-	-	-	-	15.6	22.2	62.1	clay	-	-	-	-
*Honeygrove Clay (14) Sec. 10, T14S, R7W W½,SE¼,NW¼.	0-6	A1	0	-	-	-	-	-	24.2	34.5	40.3	clay	.7	56.0	-	21.4
	6-12	A3	5	-	-	-	-	-	22.9	35.1	42.0	clay	-	-	-	-
	12-19	B11	0	-	-	-	-	-	20.9	31.6	48.5	clay	-	-	-	-
	19-27	B12t	0	-	-	-	-	-	17.9	32.2	49.9	clay	-	-	-	-
	27-36	B21t	0	-	-	-	-	-	16.4	29.6	54.0	clay	-	-	-	-
	36-72	B22t	0	-	-	-	-	-	16.1	25.6	58.3	clay	-	-	-	-
	72-95	B23t	5	-	-	-	-	-	17.7	26.7	55.7	clay	-	-	-	-
	95-105	B3t	5	-	-	-	-	-	20.5	27.6	51.7	clay	-	-	-	-
Honeygrove (14) Sec. 20, T28S, R12W NW¼,SW¼,SE¼. Coos County, Oregon 1955 ele. 600'	0-4	A1	4.0	2.4	6.3	5.3	10.2	7.7	31.9	43.3	24.8	loam	-	46.0	39.7	19
	4-11	A3	3.6	2.6	5.9	4.8	8.4	6.4	28.1	40.7	31.2	clay loam	-	32.3	29.3	18
	11-18	B21	1.7	2.7	5.3	4.2	6.8	5.5	24.5	36.6	38.9	clay loam	-	29.8	27.2	18
	18-31	B22	0.7	2.0	4.3	3.8	6.1	4.9	21.1	32.7	46.2	clay	-	29.5	26.9	18
	31-46	B31	1.5	1.8	3.4	3.0	5.2	4.2	17.6	28.0	54.4	clay	-	37.3	29.1	20
	46-63	B32	2.4	1.2	3.2	3.0	5.9	3.5	16.8	26.9	56.3	clay	-	35.4	29.9	21
	63-72	B33	2.4	0.9	3.8	3.4	5.8	4.9	18.8	24.2	57.0	clay	-	37.1	30.8	22
	72-78+	C	-	1.2	5.8	5.6	8.5	5.5	26.6	21.5	51.9	clay	-	33.9	28.5	19
Honeygrove (14) Sec. 9, T28S, R12W SE¼,NW¼. Coos County, Oregon 1955 ele. 1,081'	0-4	A1	10.9	2.1	3.4	1.8	3.3	3.6	14.2	56.4	29.4	silty clay loam	-	58.0	48.8	29.8
	4-11	A3	4.3	3.3	2.8	1.7	3.2	3.8	14.8	49.0	36.2	silty clay loam	-	34.9	33.8	23.7
	11-24	B21	4.2	1.6	2.7	1.6	3.3	3.9	13.1	44.5	42.4	silty clay	-	36.1	33.9	24.0
	24-35	B22	4.4	1.7	2.1	1.3	2.9	3.6	11.6	41.7	46.7	silty clay	-	37.8	34.8	24.1
	35-46	B31	4.1	0.7	1.0	0.8	2.6	4.5	9.6	38.6	51.8	clay	-	39.1	35.8	25.8
	46-56	B32	1.3	0.1	0.2	0.3	1.9	5.6	8.1	46.7	45.2	silty clay	-	40.2	36.4	25.6
	56-68	B33	-	0.2	1.7	2.2	9.0	10.3	23.4	41.8	34.8	clay	-	47.6	42.5	25.3
	68-80+	C	-	0.6	2.6	2.6	10.3	11.5	27.6	44.8	27.6	clay	-	51.0	44.5	24.5
*Apt (50) Sec. 19, T14S, R7W S½,NW¼,SW¼,NE¼.	0-2	A11	5	-	-	-	-	-	18.4	38.5	43.1	clay	-	-	-	-
	2-8	A12	5	-	-	-	-	-	15.0	40.1	45.0	clay	-	-	-	-
	8-19	B1t	5	-	-	-	-	-	11.0	36.5	52.6	clay	1.2	46.0	-	24.7
	19-24	B21t	15	-	-	-	-	-	8.8	34.2	57.0	clay	-	-	-	-
	24-37	B22t	20	-	-	-	-	-	8.5	42.3	48.2	gravelly silty clay	1.2	49.1	-	24.0
	37-49	B23t	30	-	-	-	-	-	8.3	42.1	49.6	gravelly silty clay	-	-	-	-
	49-63	B3	50	-	-	-	-	-	16.9	47.3	35.8	very gravelly silty clay	-	-	-	-

Table 11 - Physical Properties of Selected Soils

Soil Name Sample No. Location	Depth From Surface	Horizon	Coarse Fragments 2	Partial Size Distribution in Millimeters								Textural Class	Bulk Density	Moisture Held At		
				Very Coarse Sand (2-1)	Coarse Sand (1-0.5)	Medium Sand (0.5-0.25)	Fine Sand (0.25-0.1)	Very Fine Sand (0.1-0.05)	Total Sand	Silt (.05-.002)	Clay (.002)			1/10 Bar	1/3 Bar	15 Bar
	Inches			%	%	%	%	%	%	%	%		g/cc	%	%	%
*Preacher Clay Loam	0-6	A1	5	-	-	-	-	-	31.1	34.9	33.9	clay loam	-	-	-	-
(57)	6-14	A3	0	-	-	-	-	-	30.4	34.2	35.4	clay loam	.9	50.0	-	23.2
Sec. 24, T5S, R10W	14-28	B21	10	-	-	-	-	-	29.7	36.0	34.3	clay loam	-	-	-	-
N½,NW¼,NW¼,SW¼.	28-42	B22	10	-	-	-	-	-	29.7	36.0	34.3	clay loam	-	-	-	-
	42-60	IIC	5	-	-	-	-	-	67.9	25.0	7.1	silty loam	-	-	-	-
	60-70	IIC2	80	-	-	-	-	-	69.2	14.5	16.3	silty loam	-	-	-	-
*Digger Gravelly Loam	0-4	A1	40	-	-	-	-	-	41.8	36.6	21.7	gravelly loam	-	-	-	-
(66)	4-18	B1	20	-	-	-	-	-	42.0	36.0	22.0	gravelly loam	-	-	-	-
Sec. 10, T14S, R7W	18-30	B2	45	-	-	-	-	-	45.5	30.0	24.5	gravelly loam	-	-	-	-
S½,SE¼,SW¼,NW¼.																
Beekman	0-3	A1	2	5.2	5.8	5.4	12.4	12.6	41.3	43.4	15.3	loam	-	-	-	8.2
(371)	3-9	B1	2	4.8	5.8	5.1	13.0	13.1	41.7	40.3	18.0	loam	-	-	-	9.2
Sec. 29, T31S, R7W	9-24	B2	2	3.3	5.7	5.2	0.8	24.6	39.7	38.8	21.5	loam	-	-	-	8.4
NW¼,SE¼.	24-34	B3	2	3.7	5.5	5.1	6.8	18.2	39.5	39.8	20.7	loam	-	-	-	9.2
**Pollard	0-6	A1	-	4.50	3.9	3.6	8.6	8.5	29.1	43.8	27.7	clay loam	-	-	-	12.7
(380)	6-15	B1	-	2.50	4.1	3.7	8.2	8.4	27.0	42.7	30.4	clay loam	-	-	-	12.7
S71-ORE-10-4 (1-5)	15-28	B21t	-	2.80	3.1	3.2	0.7	3.9	23.5	37.2	39.3	clay loam	-	-	-	18.8
Sec. 29, T31S, R7W	28-48	B22t	-	2.10	3.2	3.7	5.4	7.7	22.1	28.7	49.2	clay	-	-	-	22.5
SW¼,SW¼.	48-70	B3	-	1.10	1.7	2.0	0.8	3.4	19.1	32.6	48.4	clay	-	-	-	22.7
**Pollard	0-6	A1	-	4.80	5.4	3.4	1.0	11.2	25.8	34.9	39.3	clay loam	-	-	-	18.9
(380)	6-12	B1	-	4.40	4.3	2.9	5.0	6.0	22.5	35.5	42.0	clay	-	-	-	23.4
S71-ORE-10-2 (1-5)	12-28	B21t	-	2.90	3.7	2.4	4.6	5.5	18.9	23.5	57.6	clay	-	-	-	30.2
Sec. 11, T31S, R8W	28-40	B22t	-	2.90	3.4	2.3	1.0	7.9	17.5	26.4	56.2	clay	-	-	-	29.6
NW¼,SW¼.	40-70	B3	-	4.20	5.0	3.5	3.5	9.2	25.3	20.1	54.6	clay	-	-	-	28.7
Siskiyou	0-4	A1	-	1.06	16.1	11.3	17.6	13.8	59.3	29.3	10.9	sandy loam	-	-	29.5	9.9
(721)	4-11	AC1	-	1.47	17.9	11.8	8.6	22.0	61.8	29.1	9.2	sandy loam	-	-	21.1	6.3
Josephine Co., Merlin	11-19	AC2	-	1.41	17.6	12.0	17.4	12.3	60.7	30.7	8.6	sandy loam	-	-	18.7	5.6
Summit, ele. 1680'	19-31	C1	-	0.89	16.7	11.5	17.6	13.2	59.9	31.9	8.2	sandy loam	-	-	19.1	5.5
1973	31-40	C2	-	1.24	20.9	12.8	21.5	14.2	70.7	20.5	8.8	sandy loam	-	-	-	6.4
	40-46	C3	-	3.57	26.6	12.9	19.6	14.9	77.5	14.8	7.7	loamy sand	-	-	-	-
Holland	0-4	A1	-	1.6	16.2	10.8	16.1	11.6	56.3	30.0	13.7	sandy loam	-	-	23.7	6.8
(722)	4-8	A2	-	1.4	14.5	11.0	0.9	26.6	54.5	32.9	12.5	sandy loam	-	-	-	6.0
Sec. 4, T36S, R6W	8-14	B1	-	0.6	13.2	10.5	11.2	15.9	52.4	29.9	17.7	sandy loam	-	-	20.0	6.9
NW¼,SW¼,NE¼.	14-28	B21t	-	0.8	11.5	9.5	10.8	15.1	47.7	28.2	24.1	sandy clay loam	-	-	21.8	10.8
ele. 1,100', 1973	28-34	B22t	-	1.1	13.5	10.5	15.2	12.7	53.0	28.2	18.9	sandy loam	-	-	-	10.1
	34-49	B3	-	2.4	18.9	11.5	16.2	12.4	61.4	27.0	11.6	sandy loam	-	-	-	-
	49-60	C1	-	1.3	15.3	11.4	18.0	14.1	60.1	28.6	11.3	sandy loam	-	-	-	-

Table 11 - Physical Properties of Selected Soils

Soil Name Sample No. Location	Depth From Surface	Horizon	Coarse Fragments 2	Partial Size Distribution in Millimeters								Textural Class	Bulk Density	Moisture Held At		
				Very Coarse Sand (2-1)	Coarse Sand (1-0.5)	Medium Sand (0.5-0.25)	Fine Sand (0.25-0.1)	Very Fine Sand (0.1-0.05)	Total Sand	Silt (.05-.002)	Clay (.002)			1/10 Bar	1/3 Bar	15 Bar
	Inches			%	%	%	%	%	%	%	%		g/cc	%	%	%
+Freezner	0-9	A1	14	4.9	8.9	3.2	6.2	5.5	28.7	47.1	24.2	-	-	-	-	14.9
(741)	9-16	B1	2	1.0	4.2	2.6	6.0	5.6	19.4	46.7	33.9	-	-	-	-	22.5
Sec. 21, T28S, R2E	16-24	B21t	2	0.7	2.4	1.9	5.0	5.3	15.3	41.2	43.5	-	-	-	-	24.9
SE¼,SE¼.	24-32	B22t	0	0.4	2.7	2.1	5.2	5.0	15.4	33.3	46.3	-	-	-	-	26.5
	32-45	B23t	0	0.5	2.6	2.5	5.6	5.1	16.3	39.5	44.2	-	-	-	-	26.8
	45-56	B3t	1	0.8	3.3	3.0	6.6	6.3	20.0	41.5	38.5	-	-	-	-	26.0
	56-72	C1	2	1.1	4.1	3.7	7.5	7.2	23.6	39.2	37.2	-	-	-	-	21.2

*Taken from Alsea Survey (Corliss, 1973)
+Taken from South Umpqua Survey (Richlen, et. al., 1973)
**Taken from Medford BLM Soils Inventory (deMoulin, et. al., 1975)

Table 12 - Chemical Properties of Selected Soils

Soil Name Sample No. Location	Depth From Surface	Horizon	Soil Reaction (Water 1:1)	Organic Matter			Cation Exchange Capacity (NH_4OAc)	Extractible Cations (Milliequivalent per 100 grams of Soil)				Base Saturation (NH_4OAc)
				Organic Matter (OC/0.58)	Nitrogen	Carbon-Nitrogen Ratio		Calcium	Magnesium	Sodium	Potassium	
	Inches		pH	%	%		%					%
***Blachly Clay Loam (10) Sec. 22, T15S, R8W N½,SW¼,SE¼,NW¼.	0-9	A1	5.6	7.1	.22	32.4	36.3	2.3	1.1	.3	.6	11.8
	9-20	B11	6.0	1.5	.18	18.1	17.5	1.7	.7	.2	.3	16.3
	20-31	B12	5.7	1.0	.16	16.8	15.9	1.3	.6	.3	.2	15.2
	31-44	B21	5.7	.6	.04	14.8	16.0	1.0	.5	.2	.3	13.2
	44-53	B22	5.6	.3	.02	17.0	12.3	1.0	.5	.2	.2	14.3
	53-78	B23	5.6	.2	.03	8.0	10.9	1.3	.4	.1	.2	18.2
	78-94	B3	5.7	.3	.02	8.5	20.0	.6	.5	.1	.1	6.3
*Bellpine (Tuff) (13) 460' east of NW corner of Sec. 31, T18S, R3W	0-3	A11	-	14.6	-	-	64.6	32.0	8.8	0.1	2.3	66.8
	3-9	A12	-	6.3	-	-	53.0	23.4	8.3	0.1	1.5	62.8
	9-14	B1	-	4.3	-	-	49.5	18.8	9.0	-	1.1	58.3
	14-22	IIB2t	-	2.3	-	-	49.4	8.0	7.9	0.1	0.5	33.4
	22-30	IIB3t	-	1.1	-	-	53.3	6.4	7.7	0.1	0.4	27.3
	30-36	IIC	-	0.4	-	-	55.0	4.0	7.5	1.0	0.3	23.2
*Bellpine (Eugene Sandstone) (13) Sec. 9, T18S, R3W NW¼,NW¼,SW¼.	0-3	A11	-	9.9	-	-	44.4	16.6	9.0	0.1	1.3	60.8
	3-9	A12	-	4.5	-	-	40.4	13.0	8.3	0.1	1.0	55.4
	9-12	IIB1	-	1.8	-	-	28.7	6.0	5.5	0.1	0.4	41.8
	12-24	IIB2t	-	1.7	-	-	46.0	8.6	9.2	0.1	0.6	40.2
	24-34	IIB3t	-	0.5	-	-	45.5	7.2	7.4	1.0	0.5	35.3
	34+	IIIC	-	0.3	-	-	36.5	5.4	6.3	1.0	0.3	35.6
***Honeygrove Clay (14) Sec. 10, T14S, R7W W½,SE¼,NW¼.	0-6	A1	6.4	4.4	.28	15.7	35.7	12.2	7.3	.3	3.4	66.6
	6-12	A3	6.1	4.0	.18	22.2	33.4	3.4	2.5	.5	.8	21.6
	12-19	B11	5.7	2.4	.11	21.9	28.2	5.4	3.1	.2	2.0	38.0
	19-27	B12t	5.6	1.2	.06	9.0	26.8	11.0	5.0	.3	3.2	72.6
	27-36	B21t	5.5	.3	.04	7.5	24.8	4.1	2.9	.3	.3	30.4
	36-72	B22t	5.4	.3	.03	10.0	24.5	2.5	1.8	.2	.2	18.7
	72-95	B23t	5.4	.1	.02	6.5	23.1	1.4	1.4	.3	.2	14.2
	95-105	B3t	5.3	.2	.02	9.5	25.6	1.3	1.1	.2	.3	11.4
***Apt (50) Sec. 19, T15S, R7W S½,NW¼,SW¼,NE¼	0-2	A11	6.3	6.9	.32	21.6	45.0	31.1	12.4	.3	3.5	100.0
	2-8	A12	6.5	5.1	.29	17.7	41.9	25.6	10.0	.2	3.0	92.6
	8-19	B1t	5.9	1.9	.11	16.9	34.2	8.0	5.0	.2	1.0	41.5
	19-24	B21t	5.6	.8	.06	13.7	34.2	6.1	4.2	.3	.4	32.2
	24-37	B22t	5.7	.4	.03	13.0	35.3	4.0	2.9	.3	.3	21.2
	37-49	B23t	5.8	.3	.03	9.0	32.6	3.4	2.9	.3	.3	21.2
	49-63	B3	5.5	.5	.03	2.0	33.5	2.5	2.2	.2	.3	15.5
***Preacher Clay Loam (57) Sec. 24, T15S, R10W N½,NW¼,NW¼,SW¼.	0-6	A1	5.3	4.9	.25	19.4	32.8	2.1	2.5	.5	.6	17.4
	6-14	A3	5.1	3.2	.19	16.8	26.0	.2	.6	.4	.5	6.2
	14-28	B21	5.2	2.2	.14	16.1	23.1	.3	.4	.4	.3	6.0
	28-42	B22	5.1	1.6	.11	15.1	21.1	.3	.4	.5	.3	6.5
	42-60	IIC	5.0	.2	.16	1.2	26.0	.2	.4	.5	.2	4.9
	60-70	IIR[1]	5.0	.2	.02	9.5	27.0	.2	.4	.4	.2	4.3

Table 12 - Chemical Properties of Selected Soils

Soil Name Sample No. Location	Depth From Surface	Horizon	Soil Reaction (Water 1:1)	Organic Matter			Cation Exchange Capacity (NH_4OAc)	Extractible Cations (Milliequivalent per 100 grams of Soil)				Base Saturation (NH_4OAc)
				Organic Matter (OC/0.58)	Nitrogen	Carbon-Nitrogen Ratio		Calcium	Magnesium	Sodium	Potassium	
	Inches		pH	%	%		%					%
***Digger Gravelly Loam	0-4	A1	6.0	3.5	.14	24.6	28.2	15.4	6.5	.2	1.4	83.5
(66)	4-18	B1	6.0	2.1	.10	21.2	24.5	12.5	6.4	.2	.7	80.9
Sec. 10, T14S, R7W	18-30	B2	5.9	.6	.04	14.8	23.1	13.6	8.7	.2	1.0	97.3
SE¼,SW¼,NW¼.												
**Beekman	0-3	A1	5.6	4.0	-	-	-	5.1	1.4	0.05	0.56	46.1
(371)	3-9	B1	5.6	7.4	-	-	-	7.1	1.7	0.1	0.56	45.1
Sec. 29, T31S, R7W	9-24	B2	5.7	2.0	-	-	-	4.4	1.3	0.1	0.63	32.9
NW¼,SE¼.(Rabbit Mt)	24-34	B3	5.7	2.3	-	-	-	5.1	1.5	0.1	0.58	44.7
**Pollard	0-6	A1	5.5	7.8	-	-	-	5.1	1.7	0.1	1.0	36.2
(380)	6-15	B1	5.5	2.4	-	-	-	2.4	1.5	0.05	0.9	32.8
Sec. 29, T31S, R7W	15-28	B21t	5.5	1.6	-	-	-	2.0	2.4	0.1	0.9	32.7
SW¼,SW¼.(Rabbit Mt)	28-48	B22t	5.4	0.7	-	-	-	0.7	2.1	0.1	0.7	21.3
	48-70	B3	5.4	0.5	-	-	-	0.2	1.9	0.1	0.5	14.9
Atring	0-12	surface soil	5.2	4.7	-	-	18.0	0.4	0.76	-	0.70	10.0
(394)												
Coos Bay Dist.,BLM	12-29	subsoil	5.6	-	-	-	14.4	0.1	0.30	-	0.42	5.3
++Siskiyou	0-4	A1	6.5	6.73	-	-	25.18	12.20	1.30	0.10	0.58	56.3
(721)	4-11	A3	6.3	2.68	-	-	12.89	5.10	0.56	0.07	0.46	48.0
S71-ORE-17-1 (1-5)	11-19	B2	6.0	0.81	-	-	9.29	3.40	0.56	0.07	0.36	47.3
Sec. 3, T35S, R6W	19-31	C1	6.0	-	-	-	9.41	4.10	0.90	0.10	0.31	57.5
NW¼,SE¼,SE¼.	31-40	C2	5.8	-	-	-	14.45	7.80	2.20	0.14	0.31	72.3
++Holland	0-4	A1	6.3	3.64	-	-	14.62	6.40	1.40	0.10	0.42	56.9
(722)	4-8	A3	6.0	0.96	-	-	9.22	3.70	1.10	0.10	0.22	55.5
S71-ORE-17-2 (1-7)	8-14	B1	5.9	0.71	-	-	9.21	3.40	1.50	0.10	0.11	55.5
Sec. 4, T36S, R6W	14-28	B21t	5.6	-	-	-	12.81	4.70	3.60	0.14	0.07	66.4
NW¼,SE¼,NE¼.	28-34	B22t	5.7	-	-	-	14.51	5.70	4.30	0.24	0.07	71.1
	34-49	B3	5.5	-	-	-	15.82	7.40	5.10	0.19	0.03	80.4
	49-60	C1	5.8	-	-	-	16.27	8.10	4.90	0.24	0.03	81.6
+Vena	0-5	A1	5.9	4.9	0.11	26.0	18.8	5.0	1.4	0.1	0.8	-
(731)	5-12	B21	5.9	3.1	0.08	23.0	17.6	4.3	1.4	0.1	0.6	-
Sec. 34, T28S, R1E	12-25	B22	5.7	2.5	0.06	24.0	16.4	2.6	1.5	0.1	0.3	-
SW¼,NE¼.												
+Shippa	0-5	A1	5.6	6.1	0.1	51	16.0	4.3	1.0	0.1	0.5	-
(732)	5-9	AC	6.0	2.4	0.1	28	10.9	1.4	0.4	0.1	0.4	-
Sec. 30, T28S, R2E												
NE¼,NW¼.												

Table 12 - Chemical Properties of Selected Soils

Soil Name Sample No. Location	Depth From Surface	Horizon	Soil Reaction (Water 1:1)	Organic Matter			Cation Exchange Capacity (NH_4OAc)	Extractible Cations (Milliequivalent per 100 grams of Soil)				Base Saturation (NH_4OAc)
				Organic Matter (OC/0.58)	Nitrogen	Carbon-Nitrogen Ratio		Calcium	Magnesium	Sodium	Potassium	
	Inches		pH	%	%		%					%
+Freezner	0-9	A1	5.4	4.0	0.1	24.0	39.8	9.8	3.1	0.1	0.9	40
(741)	9-16	B1	5.2	1.3	0.05	15.4	37.4	10.2	4.2	0.2	0.8	45
Sec. 21, T28S, R2E	16-24	B21t	5.2	0.8	0.04	14.0	38.1	11.3	4.8	0.2	0.9	49
SE¼,SE¼.	24-32	B22t	5.1	0.4	0.02	12.8	37.8	11.6	5.2	0.1	1.1	52
	32-45	B23t	5.0	0.3	-	-	39.5	11.4	5.3	0.1	1.2	52
	45-56	B3t	5.1	0.2	-	-	38.5	10.8	5.4	0.2	1.2	52
	56-72+	C1	5.2	0.3	-	-	36.5	8.6	4.7	0.2	1.2	47

*Data from Lane County Survey (Unpublished)
+Data from South Umpqua Survey (Richlen, et. al., 1973)
**Data from O.S.U. Soils Lab (Unpublished)
++Data from Medford's Report (deMoulin, et. al., 1975)
***These data taken from Alsea Survey (Corliss, 1973)

Table 13. Engineering Properties and Classifications of Soils

Map Symbol	Soil Name and Location	Depth From Surface (Inches)	Depth to Bedrock	Classification			Coarse Fraction >2 mm (%)	% Passing Sieve Number				Percent		Moisture Density	
				USDA	Unified	AASHO		4	10	40	200	Liquid Limit (LL)	Plasticity Index (PI)	Maximum Dry Density (lbs/cu.ft.)	Optimum Moisture (Percent)
10	Blachly[1] N½,SW¼,SE¼,NW¼. Sec. 22, T15S, R8W	0-10 10-31 31-44 44-53	>5'	clay loam clay clay clay	SM MH MH MH	A-4(1) A-5(7) A-5(8) A-5(6)	0-5 0-5 0-5 0-5	98 99 99 99	94 98 99 98	74 90 96 93	40 60 66 57	NP 55 53 56	- 6 9 10	72 80 85 84	46 37 34 33
12x, 12t	Jory[1] SW¼,SW¼. Sec. 25, T8S, R3W	0-5 28-35 50-78+	>5'	- - -	ML ML ML	A-7-5(6) A-7-6-(10) S-7-5(8)	0-5 0-5 0-5	- - -	100 100 100	69 90 81	52 76 68	49 42 46	15 13 12	89 99 95	30 24 28
12	Jory[2] (basalt) NW¼,NW¼,NE¼. Sec. 13, T8S, R3W	0-4 20-28 50-63	>5'	- - -	ML CL ML-CL	A-7-5(9) A-6-(11) A-7-6(14)	0-5 0-5 0-5	- - -	100 100 100	82 96 96	65 85 86	48 40 49	15 18 20	89 103 93	29 23 29
13	Bellpine[3] NW¼,NW¼. Sec. 31, T18S, R3W	14-30	>5'	-	MH	A-7-5(11)	0-5	100	99	82	48	77	35	-	-
14x, 14t	Honeygrove[1] (sediments) W½,SE¼,NW¼. Sec. 10, T14S, R7W	0-6 36-72	>5'	- -	ML MH	A-4(4) S-5(10)	0-5 0-5	99 99	94 98	83 96	57 69	NP 56	- 6	74 87	36 32
20, 20t	Peavine[1] (sediments) SW¼,SW¼,SE¼. Sec. 10, T3S, R5W	4-10 15-26 64-84	>3'	- - -	ML MH SM	A-7-5(13) A-7-6(20) A-7-5(3)	0-5 5-10 5-10	- - -	100 100 100	87 86 64	78 76 39	49 84 67	18 42 16	87 75 76	29 36 41
50	Apt[1] S½,NE¼,SW¼,NE¼. Sec. 19, T14S, R7W	8-19 24-37	>5'	- -	MH SM	A-7-5(8) A-5(3)	0-5 0-5	96 85	85 69	82 67	62 41	55 58	12 6	84 83	32 34
57	Preacher[1] N½,NW¼,NW¼,SW¼. Sec. 24, T15S, R10W	6-14 28-42	>5'	- -	SM MH	A-5(3) A-7-5(7)	5-10 5-20	99 99	99 99	82 95	47 60	52 51	7 12	79 83	36 33
66	Digger[1] S½,SE¼,SW¼,NW¼. Sec. 10, T14S, R7W	4-18 18-30	>3'	- -	ML SM	A-4(3) A-4(2)	5-15 >35	85 80	82 79	74 73	51 46	37 38	8 8	95 98	24 23
370	Kanid[4]	0-60	40"+	gravelly clay loam	CL	A-6	0-40 (>3")	-	-	-	-	25-35	15-20	-	-
371	Beekman[4]	0-9 9-34	20-40"	loam very gravelly loam	ML or CL-ML GM	A-4 or A-6 A-2	0 (>3") 0-20 (>3")	- -	- -	- -	- -	25-35 25-35	5-10 5-10	- -	- -

Table 13. Engineering Properties and Classifications of Soils

Map Symbol	Soil Name and Location	Depth From Surface (Inches)	Depth to Bedrock	Classification			Coarse Fraction >2 mm (%)	% Passing Sieve Number				Percent		Moisture Density	
				USDA	Unified	AASHO		4	10	40	200	Liquid Limit (LL)	Plasticity Index (PI)	Maximum Dry Density (lbs/cu.ft.)	Optimum Moisture (Percent)
372	Vermisa[4]	0-12	12-20"	very gravelly loam	GM	A-4 or A-2	0-20 (>3")	-	-	-	-	20-30	5-10	-	-
380	Pollard[4]	0-9	40"+	loam or clay loam	ML or CL	A-6	0-15 (>3")	-	-	-	-	35-40	10-15	-	-
		9-50		clay	ML or MH	A-7-5	0	-	-	-	-	45-55	15-20	-	-
381	McGinnis[4]	0-14	20-40"	gravelly loam or gravelly clay loam	ML or GM	A-4 or A-6	0	-	-	-	-	25-40	5-15	-	-
		14-34		gravelly loam or gravelly clay loam	CL or ML	A-6 or A-7-5	0-20 (>3")	-	-	-	-	35-50	15-25	-	-
382	Tishar[4]	0-11	40"+	gravelly clay loam	GM	A-4 or A-6	0-10 (>3")	-	-	-	-	25-40	5-15	-	-
		11-74		very gravelly clay or very gravelly silty clay	GC or CL	A-7-5	0-20 (>3")	-	-	-	-	45-55	15-20	-	-
394	Atring (siltstone) NE¼,SW¼. Sec. 17, T24S, R7W	6-36	>3'		SW-SM	A-2-7	20-40	88	66	30	10	46	16	-	-
		36+			SW-SM	A-2-5	40-60	77	48	22	9	41	8	-	-
394	Atring (sandstone) SE¼,NE¼. Sec. 17, T24S, R6W	6-20	>3'		SC	A-2-4	20-40	94	82	56	17	26	3	-	-
		20-40			SM	A-2-4	40-60	95	84	56	16	23	NP	-	-
396, 396t	Bateman (sandstone) NW¼,SE¼. Sec. 5, T24S, R6W	17-24	>5'		SC	A-2-7	0-5	72	48	27	11	60	22	-	-
		26-36			SC	A-2-7	0-10	72	50	22	9	58	23	-	-
		36-50			SW-SM	A-2-5	0-10	85	56	23	8	61	9	-	-
721	Siskiyou[4]	0-36	20-40"	gravelly coarse sandy loam	SM	A-2-4	0-5 (>3")	-	-	-	-	-	NP	-	-
722	Holland[4]	0-14	40"+	loam	SM	A-4	0 (>3")	-	-	-	-	-	NP	-	-
731	Vena[4]	0-6	20-40"	gravelly loam	ML	A-2-4 or A-2-6	0-20 (>3")	-	-	-	-	-	NP	-	-
		6-36		very gravelly loam	GM, GC or GM-GC	A-4 or A-6	0-30 (>3")	-	-	-	-	25-35	5-15		

Table 13. Engineering Properties and Classifications of Soils

Map Symbol	Soil Name and Location	Depth From Surface (Inches)	Depth to Bedrock	Classification			Coarse Fraction >2 mm (%)	% Passing Sieve Number				Percent		Moisture Density	
				USDA	Unified	AASHO		4	10	40	200	Liquid Limit (LL)	Plasticity Index (PI)	Maximum Dry Density (lbs/cu.ft.)	Optimum Moisture (Percent)
741	Freezner[5] SE¼,SE¼. Sec. 21, T28S, R2W	0-9 24-32 56-72	> 5'	clay loam clay gravelly clay	ML MH MH	A-5(5) A-7-5(15) A-7-5(12)	- - 35-50	96 100 95	85 100 93	68 95 86	57 86 74	43 62 55	4 18 12	87 85 84	28 33 35
770	Pearsoll[4]	0-14	12-20"	very gravelly clay loam and very cobbly clay	GC or CH	A-7-6 or A-2-7	35-75 (>3")	-	-	-	-	45-65	25-30	-	-
824	Jayar[4]	0-12 12-32	20-40"	gravelly loam gravelly clay loam	SM or ML CL-ML	A-2-4 or A-4 A-6 or A-4	0-20 (>3") 0-10 (>3")	- -	- -	- -	- -	20-30 25-30	0-5 5-10	- -	- -
825	Skymor[4]	0-15	12-20"	very gravelly loam and very cobbly loam	GM	A-4	0-30 (>3")	-	-	-	-	20-30	0-5	-	-

1 - Data taken from Segment III, Willamette Valley (Thomas et. al., 1969)
2 - Data taken from Marion County survey (Williams et. al., 1972)
3 - Data taken from Lane County Soil Survey (Unpublished)
4 - Data taken from BLM Medford District Soil Inventory Report (deMoulin et. al., 1975)
5 - Data taken from South Umpqua Survey (Richlen, et. al., 1973)

The highest density obtained in the compaction test is called maximum dry density. Maximum strength of earthwork is generally obtained if the soil is compacted to maximum dry density.

For specific projects such as small earth dams, soil samples should be tested for optimum moisture and maximum dry density. Soils are far too heterogeneous for the data in Table 13 to be of use on specific projects. About 50 pounds of soil is needed for the compaction test (Proctor Test).

The "liquid limit" and "plasticity index" indicate the affect of water content on the strength and consistency of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from a semisolid to a plastic state and the liquid limit is the moisture content when a soil changes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

The liquid limit and plasticity index are obtained either by engineering tests or by estimates of USDA texture and consistency. If 15-bar water percentage is known, liquid limit can be estimated as follows: two times 15-bar water percentage equals liquid limit.

In addition to the U. S. Department of Agriculture soil textural classification in Table 13 , are the Unified Soils Classification System established by the Waterways Experiment Station, Corps of Engineers and the American Association of State Highway Officials (AASHO) system. The classifications in Table 13 are estimates based on laboratory analysis and field study and comparison with similar soils in other areas.

The Unified Soil Classification System is used mainly by the Corps of Engineers and the U. S. Bureau of Reclamation to evaluate soils for roads, airfields, embankments and foundations. The system classifies soils according to their textural and plasticity qualities and their performance as engineering construction materials. The following properties form the basis of soil identification: (1) percentage of gravel, sand and fines (fraction passing the #200 sieve); (2) the shape of the grain size distribution curve; (3) plasticity and compressibility characteristics. The soil is given a letter symbol indicating its principal characteristics, such as ML for loamy or silty soils with low plasticity.

On the basis of texture, the soils are divided into (1) coarse-grained, (2) fine-grained and (3) highly organic soils in the Unified system. The coarse-grained soils contain 50 percent or less material smaller than the #200 sieve. Highly organic soils are generally identified visually.

Coarse-grained soils are subdivided into gravels (G) and sand (S). The gravels have more than 50 percent of the coarse fraction retained on the #4 sieve and the sands have the greater portion passing the #4 sieve. The four secondary divisions of each group - GS, GP, GM and GC or SW, SP, SM and SC - depend on the amount and type of fines and the shape of the grain size distribution curve. The letter W is for well graded; the P is for poorly graded; the M means silty or medium sized; the C means clayey. The grain size curves of well-graded (W) materials are smooth and concave with no sizes lacking and no excess of materials in any size range.

Fine-grained soils are subdivided into silts (M) and (C) depending on their liquid limit and plasticity index. Soils for which the plasticity index is less than three-fourths of the liquid limit, minus the constant 15, are M soils. Those for which the plasticity index is greater than three-fourths of the liquid limit, minus 15, are C soils. If the liquid limit is less than 50 percent, the fine-grained soils are ML or CL. If the liquid limit is greater than 50 percent, they are classified MH or CH. Peat and other highly organic soils are identified at Pt. Organic silts and silty clays of low plasticity are identified as OL and organic clays of medium to high plasticity are identified as OH.

In general, the coarse-grained soils, especially when well graded (GS and SW), are most desirable for roadways and foundations and least desirable for reservoirs. They have high bulk densities, are easy to compact, have low compressibility and expansion potential, have low potential frost action, and have a high permeability. The fine-grained soils with high liquid limits (MH and CH) are least desirable for nearly all engineering uses of soils because of their low shearing strengths, high expansion potential, high potential frost action, high corrosion potential, low permeability, and low bulk densities. The most desirable soils for earth embankments to retain water are classified as GC and SC or clayey gravels and clayey sands. Such soils can be compacted relatively easily and, once compacted, have very low permeabilities and are not subject to potential expansion and frost action.

The American Association of State Highway Officials (AASHO) soil classification system is based on the field performance of soils. In this system, classification is based on gradation (particle size distribution), liquid limit and plasticity index of the soils. Grouping soils of about the same general load-carrying capacity and service results in seven basic groups that are designated A-1 through A-7. The best soils for road subgrades are classified as A-1, the next best A-2, etc., with the poorest soils classified as A-7.

Soils groups A-1, A-2 and A-3 are called granular materials and include soils having less than 35 percent of the soil material including gravels and cobbles passing through a #200 sieve. Groups A-4, A-5, A-6 and A-7 are called silt-clay materials and include soils for which more than 35 percent of the material passes through a #200 sieve.

A-1 soils are well-graded mixtures from coarse to fine with a nonplastic or feebly plastic soil binder. A-1-a soils include those materials consisting predominantly of stone fragments or gravel (more than 50 percent is retained on a #10 sieve). A-1-b soils include those materials consisting predominantly of coarse sand (more than 50 percent passes a #10 sieve and more than 50 percent is retained on a #40 sieve). A-1 soils generally are highly stable under wheel loads regardless of moisture conditions. They function satisfactorily as bases for thin bituminous wearing surfaces.

A-2 soils are composed of a wide range of granular materials that are subdivided into subclasses based on differences in liquid limit and plasticity index of the material passing through a #40 sieve. A-2-4 and A-2-5 soils include those granular materials that have soil binder characteristics of the A-4 and A-5 soil groups. The binder material in the A-2-4 soils is predominantly silts that have a relatively low liquid limit (less than 40). The binder material in the A-2-5 soils is very poorly graded and consists mostly of diatoms and mica which are productive of elastic properties and very low stability. A-2-6 and A-2-7 soils include those granular materials that have binder characteristics of the A-6 and A-7 soil groups. The binder material in A-2-6 soils is composed predominantly of clay with a relatively low liquid limit (less than 40) whereas it has a liquid limit of more than 40 in A-2-7 soils. A-2-4 and A-2-5 soils are satisfactory as a road base when properly drained and compacted. As a base coarse, A-2-6 and A-2-7 soils may lose stability because of capillary saturation or lack of drainage. Generally, A-2 soils are suitable as a blanketing material for very plastic subgrades over which concrete pavement is to be placed.

A-3 soils are composed of sands deficient in soil binder or coarse material. Typical of this group are fine beach sand, fine dune sand and poorly-graded fine sandy alluvium. A-3 soils lack stability under wheel loads except when they are moist. They have no volume change with variations in moisture content and make suitable subgrades for all pavement types when confined. They cannot be compacted with a sheepsfoot roller but may be compacted by vibration or by pneumatic tire or steel wheel rollers.

A-4 soils are very common in occurrence and are composed predominantly of silt. They provide a firm riding surface when dry with little rebounding after loading. When water is absorbed rapidly, these soils expand detrimentally or lose stability and they are subject to frost heave. Bituminous surfaces require substantial base coarses when placed on subgrades of this soil group.

A-5 soils are similar to A-4 soils except that they include very poorly graded soils containing such materials as diatoms and mica which are productive of elastic properties and very low stability. They are likely to rebound when load is removed when they are dry. A-5 soils are not suitable as subgrades for thin, stabilized, flexible base coarses of bituminous surfaces. They are subject to frost heave.

A-6 soils, of very common occurrence, are composed predominantly of clay with moderate to negligible amounts of coarse material. In the soft or stiff plastic state, they absorb additional water only when manipulated. They have good bearing capacity when compacted to maximum practical density but lose this bearing strength when moisture is absorbed. These soils are compressible, rebound very little when load is removed and are very expansive when compacted at a moisture condition below optimum. These soils possess little internal friction and have low stability at the higher moisture contents. A-6 soils are characterized by shrinkage cracks during dry weather. Gravitational water flow is negligible, a fact that makes ordinary drainage installation of little value. These soils are not suitable for use as subgrades under thin flexible base coarses or bituminous surfaces because of the large volume changes that are caused by moisture changes and the loss of bearing strength after the entrance of moisture.

A-7 soils are also composed predominantly of clay but, because of the presence of single-size silt particles, organic matter or lime carbonate, they are elastic. At certain moisture contents they deform quickly under load and rebound appreciably when load is removed. They make particularly undesirable subgrades for flexible pavements. A-7-5 soils represent those A-7 soils with moderate plasticity indices in relation to liquid limit and may be highly elastic as well as subject to considerable volume change. A-7-6 soils have high plasticity indices in relation to liquid limit and are subject to extremely high volume change.

VI. SOIL USE AND MANAGEMENT

Table 14 lists items that will assist managers of forest lands in planning timber harvest and reforestation programs.

A. Site Index

Soil productivity is measured by site index or site class of the major managed species. Site indices were measured primarily on Douglas-fir and identified with the soil in which they are growing. The productivity of a soil differs according to aspect, elevation, density of trees, variations in soil depth, coarse fragment content, and organic matter.

Site index ratings given in Table 14 were calculated from Tech. Bul. No. 201, USDA, Yield of Douglas-fir in the Pacific Northwest, (McArdle, 1947). Some of the detailed data that was collected is presented in the Appendix. Where available, site index ratings are given for both north and south aspect slopes. The range of site indices for each site class is given in Table 15.

Table 15. Relation of Site Classes to Ranges in Site Index Ratings

Site Class	Site Index
I	186+
II	156-185
III	126-155
IV	96-125
V	0-95

B. Regeneration Hazard

Regeneration hazard is given for bare-root stock with no distinction made for age or species. Regeneration hazard is defined as the probable success of establishing new plantings as influenced by soil or topographic conditions. Three classes are recognized. The ratings are based on the percent of plantations that are expected to regenerate on the first attempt. A low hazard means success on more than 80 percent of the plantations. A moderate hazard means success on 30 to 80 percent of the plantations. A high hazard means success on less than 30 percent of the plantations.

Table 14. Forest Management Measurements and Interpretations

Map Symbol	Soil Name	Productivity Site Index & Class*		Regeneration Hazard*		Compaction Hazard	Naturally Occurring Ceanothus Specie	Remarks
		North	South	North	South			
10	Blachly	149 III	149 III	low	low	high	Slickleaf & Redstem	
12	Jory	135 III		mod.	mod.	high	Slickleaf	Site index average of North and South
12x	Jory	135 III		mod.	mod.	high	Slickleaf	"
12t	Jory	135 III		mod.	mod.	high	Slickleaf	"
13	Belpine	135 III		mod.	mod.	high	Slickleaf	"
14	Honeygrove	175 II		low	low	high	Slickleaf & Redstem	"
14t	Honeygrove	126 III	126 III	low	low	high	Slickleaf & Redstem	"
19	Cruiser		115 IV	low	low	high	Slickleaf	
20x	Peavine	175 II		low	low	high	Slickleaf & Redstem	Site index average of North and South
20t	Peavine	126 III	126 III	low	low	high	Slickleaf & Redstem	
23	Nekia	135 III		mod.	mod.	high	Slickleaf	Site index average of North and South
24	Ritner	110 IV		mod.	high	high	Deer brush	
29	Harrington	119 IV		low	mod.	medium	Slickleaf & Redstem	
35	Kilchis	103 IV	84V	mod.	high	low	Scattered Slickleaf	
36	Witzel	92 V	84 V	high	high	medium	Scattered Deer Brush	
50	Apt	175 II	175 II	low	low	high	Slickleaf & Redstem	
53	Twindar	119 IV	94 V	mod.	mod.	low	Slickleaf	
53s	Twindar	119 IV	94 V	high	high	low	Scattered Slickleaf	

Table 14. Forest Management Measurements and Interpretations

Map Symbol	Soil Name	Productivity Site Index & Class*		Regeneration Hazard*		Compaction Hazard	Naturally Occurring Ceanothus Specie	Remarks
		North	South	North	South			
57	Preacher	160 II		low	low	medium	Slickleaf	Site index average of North and South
64	Jason	110 IV		high	high	low	Scattered Slickleaf	"
66	Digger	140 III		low	high	low	Slickleaf	
70	Zango	103 IV	90 IV	mod.	high	low	Scattered Slickleaf	Site index average of North and South
300	Shivigny	117 IV	117 IV	low	low	high	Slickleaf	"
323	Klickitat		104 IV	low	low	medium	Slickleaf	Site index is low for this soil. It was taken in an area that was burned 2-3 times in the last 150 years
360	Abegg	130 III	105 IV	mod.	high	medium	Deer Brush	
362	Chamate		110 IV	mod.	high	low	Deer Brush	
370	Kanid							
	(Dillard)	145 III	130 III	mod.	mod.	medium	Deer Brush below 2000ft.	
	(S. Umpqua)	130 III	116 IV				Slickleaf above 2000 ft.	
371	Beekman							
	(Dillard)	120 IV	115 IV	mod.	high	low	Scattered Deer Brush	
	(S. Umpqua)	132 III	84 V					
372	Vermisa	80 V	80 V	high	high	low	Scattered Wedgeleaf	
380	Pollard							
	(Dillard)	140 III	115 IV	mod.	mod.	high	Slickleaf above 2000'	
	(S. Umpqua)	122 IV	110 IV				Deer Brush below 2000'	
381	McGinnis							
	(Dillard)	140 III	115 IV	mod.	mod.	high	(same)	
	(S.Umpqua)	117 IV	100 IV					
382	Tishar							
	(S. Umpqua)	117 IV	100 IV	mod.	mod.	high	(same)	

Table 14. Forest Management Measurements and Interpretations

Map Symbol	Soil Name	Productivity Site Index & Class*		Regeneration Hazard*		Compaction Hazard	Naturally Occurring Ceanothus Specie	Remarks
		North	South	North	South			
393	Larmine	89 V	102 IV	mod.	high	low	Slickleaf & Deer Brush	Site index for north aspect was taken in Larmine soil over hard bedrock; on a south aspect it was taken on Larmine soil over soft bedrock.
394	Atring	136 III	120 IV	mod.	mod.	low	Slickleaf & Deer Brush	
395	Renhaven	136 III		low	mod.	medium	Slickleaf & Deer Brush	
396	Bateman	135 III		low	mod.	high	Slickleaf	Site index average of North and South. Bateman soil has a site index of 120 on north aspect east of Sutherlin.
396t	Bateman	135 III		low	mod.	high	Slickleaf	
397	Darby	106 IV	95 V	mod.	high	high	Deer Brush	
400	Holderman	70 V	87 V	mod.	mod.	low	Scattered Slickleaf	
410	Winberry		78 V	high	high	medium	Scattered Slickleaf	
564	Umpcoos	87 V	88 V	high	high	low	Scattered Slickleaf	
721	Siskiyou	96 V	81 V	mod.	high	medium	Deer Brush	
722	Holland	108 IV	88 V	mod.	mod.	medium	Deer Brush	
722m	Holland	125 IV	104 IV	mod.	mod.	medium	Deer Brush	
723	Barron	115 IV	107 IV	mod.	mod.	medium	Deer Brush	
724	Lettia	119 IV	86 V	mod.	mod.	high	Deer Brush	
724m	Lettia	119 IV	116 IV	mod.	mod.	high	Deer Brush	

Table 14. Forest Management Measurements and Interpretations

Map Symbol	Soil Name	Productivity Site Index & Class*		Regeneration Hazard*		Compaction Hazard	Naturally Occurring Ceanothus Specie	Remarks
		North	South	North	South			
731	Vena	110 IV	110 IV	mod.	high	low	Scattered Deer Brush	
732	Shippa+	95 V	75 V	high	high	low		
741	Freezner+	135 III	130 III	low	mod.	high	Deer Brush & Slickleaf	
743	Selmac		85 V	low	low	high	Slickleaf	
770	Pearsoll	80 V	80 V	high	high	low	Wedgeleaf & Mountain Whitethorn	Site index for Jeffrey pine; same for north & south aspect
771	Cornutt	110 IV	110 IV	high	high	medium	(same)	Site index for Jeffrey Pine.
824	Jayar+	115 IV	100 V	mod.	mod.	low	Slickleaf	
825	Skymor+	85 V	80 V	high	high	low	Slickleaf	

*For Douglas-fir unless noted otherwise
+Taken from Medford Soil Inventory Report

C. Compaction Hazard

The amount of compaction which can be obtained is influenced by the soil's physical properties, moisture content, type and amount of compaction effort. Soils are rated as having a low, medium, or high susceptibility to a compactive force that reduces its productivity by restricting root development and internal air and water movement. Low means soil properties are favorable for use under most conditions. Medium means soil properties are unfavorable and, under some conditions, use should be restricted. High means soil properties are so unfavorable that use during high soil moisture could create soil conditions very difficult to correct.

D. Naturally Occurring Ceanothus Species

While the inventory was being done, observations were made on the distribution of different ceanothus species. The ceanothus species have the ability to fix nitrogen (Scott, 1973; Woolum et. al., 1968). Some of the ceanothus are beneficial for tree establishment and wildlife browse. The ceanothus species mentioned in the table are:

Slickleaf, Ceanothus velutinus
Deer Brush, Ceanothus intergerrimus
Redstem, Ceanothus sanguineus
Mountain Whitehorn, Ceanothus cordulatus
Wedgeleaf, Ceanothus cuneatus

Slickleaf and redstem appear to be the most compatible with Douglas-fir. Deer brush often comes in very dense and retards the growth of Douglas-fir. Mountain whitethorn and wedgeleaf occur mainly on the extreme droughty sites such as the serpentine soils and serve as wildlife browse.

E. Erosion

The rate at which erosion occurs depends upon the inherent erodibility of the soil and the underlying geologic material, the climate, the topography, and the vegetative cover. Man's disturbance of the soil and the vegetative cover can accelerate erosion losses and landslide activity.

Road construction and logging operations are mainly responsible for increasing erosion and landslides. Field observations and research results in the Northwest suggest that: (1) generally, the greatest source of sediment is from logging roads; (2) sedimentation from clearcut areas is small and infrequent; and (3) severe slash burning increases the rate of surface erosion.

The proper layout and construction of roads is therefore the major factor in controlling erosion and reducing sedimentation damage. The sources of sediment, triggered by road construction are sidecast materials, ditches, cut banks, unrocked subgrades, and mass movement (slumps and landslides).

1. Surface Erosion

Surface erosion is soil losses that come from sidecast, ditch lines, cut banks and unrocked roads. Normally, the increase in erosion lasts two or three years. After that, the re-establishment of vegetation begins to reduce erosion. Fredriksen (1970), reported from a study in the Alsea River watershed, that the first storm after road construction and logging produced sediment loads that were 250 times greater than normal. Nine weeks later the sediment load was 9 times greater than normal, and after two years the sediment load was only 2.25 times above the normal load.

Megahan and Kidd (1972) studied the effects of road construction on sediment production over a 6-year period in an area having sandy soils formed from granitic parent materials. Their results are summarized in Table 16. These data again illustrate the point that most of the erosion occurs during the first year following the disturbance caused by road construction. Over 80 percent of the sediments produced in the 6-year interval, were lost in the first year, and over 93 percent were lost by the end of the second year.

Table 16. Sediment production from sandy soils over granite due to surface erosion on roads by years after construction (Megahan and Kidd, 1972).

Year	Sediment Production	Percent of Total	Accumulated Percent
	Cubic Feet/Acre		
1971-62	2,021.5	83.8	83.8
1962-63	226.6	9.4	93.2
1963-64	14.4	0.6	93.8
1964-65	52.2	2.2	96.0
1965-66	55.4	2.3	98.3
1966-67	41.5	1.7	100.0
Total	2,413.5	100.0	

Soils in the Roseburg District that are most likely to produce significant amounts of sediment as a result of surface erosion are the clayey soils and the sandy soils derived from granitic rocks.

The clayey soils are classified in the following soil series: Blachly (10), Jory (12), Bellpine (13), Honeygrove (14), Peavine (20), Nekia (23), Apt (50), Pollard (380), Bateman (396), Lettia (724), and Freezner (741).

For these soils the following practices are recommended:

(1) Mulch, seed, and fertilize new construction, before winter rains begin.

(2) Rock subgrades.

The sandy soils from granitic bedrock are in the Siskiyou (721), Holland (722) and Barron (723) series. Management practices that will aid in reducing soil losses as a result of roads that must be constructed include:

(1) Constructing roads during the summer months.

(2) In-sloping the subgrade 5 percent.

(3) Rocking the ditches.

(4) Using extra culverts with full round culvert outlets.

(5) Mulch, seed, and fertilize new construction before the wet season. A straw mulch is essential in reducing erosion (Dyrness, 1970).

(6) End haul segments where sideslopes have gradients of 70 percent or over.

(7) Rock all new road construction before winter rains begin.

(8) Roll the grade.

Lettia soils are unique. They are fine-textured and derived from granite. They produce large amounts of sediments from the slumping of cut banks and channel erosion in ditch lines. Figure 42 shows the small slumps that commonly occur on cut banks of these soils. Cut banks in Lettia soils fail when they are steeper than about ½:1 percent. Only about 30 percent of the length of the banks slump when the sideslopes are steeper than 25 percent, however. Therefore, a cut bank of ½:1 is still recommended, even though these soils usually stabilize at an angle of 1:1 because an excessive amount of material would be disturbed if the entire cut bank was 1:1 percent. Most of the sloughing occurs in these soils the first three winters after road construction.

Figure 44. Small depressional areas at the back of rotational slumps, called sag ponds, are excellent clues for unstable areas.

2. Mass Movement

The two major kinds of mass movement of soils in the District are slumps and debris avalanches. Slumps are one or more blocks of soil that have rotated out of a hillside along a bowl-shaped failure plane. Debris avalanches are the rapid movement of incoherent soil, rocks, and forest debris down steep draws (Figure 19).

Slumps occur where there is an accumulation of water and the soils are often saturated with water. The potential for triggering a slump along a proposed road can often be identified by the presence of jackstrawed trees, sag ponds (see Figure 44), water-loving vegetation, or tension cracks (Burroughs, et. al., 1973).

Slumps can be stabilized by: (a) removing weight from the upper part of the block; (b) rip rapping the toe of the block; (c) draining with horizontal drains and/or (d) surface draining to remove or divert water from the sag pond area.

Debris avalanches tend to occur in draws where the slopes are steeper than 65 percent, and the soils are shallow or moderately deep. Many debris avalanches are activated by man when he places sidecast materials in the draws during road construction. The avalanche generally occurs in the winter wet season after the overloaded soil becomes saturated.

Debris avalanches occur mostly in the areas underlain by Tyee sandstone, granite and hard tuffs and breccias. However, any headwall that is over 70 to 80 percent with a road built across it is suspect.

Local experience has shown that rolling the grade, using a minimum width road, and end hauling have substantially reduced debris flows. Particular attention needs to be given to the way the pioneer road is constructed. A method needs to be used that prevents large amounts of sidecast from being produced from the pioneer road. One technique of accomplishing this is the use of a U-shaped blade on a small tractor (D6 size).

Front end loaders and dump trucks are the most common way of taking the road down to grade. Figure 45 shows a berm that is left while the road is being taken down to grade that prevents soil from going over the side. Finding a disposal site for waste material is a difficult problem in steep terrain with sharp ridges. Selection of disposal sites requires as much care as does the location and construction of the road.

Figure 45. A berm used in Holland soils. Note the small amount of material over the edge. Much of what is over the side will be recovered when the berm is pulled back.

Some of the waste material can be placed in narrow saddles. Local experience has shown that the material can be made stable by first excavating narrow bench roads just below the saddle and on either side. Waste material can then be placed on these benches and compacted. By doing this, fills as high as 10 feet can be placed in saddles no wider than 15 feet. Soils that are associated with debris avalanches are:

Holland soils on slopes over 70 percent.
Siskiyou soils on slopes over 70 percent.
Digger soils on slopes over 75 percent.
Jason soils on slopes over 75 percent.
Umpcoos soils on slopes over 75 percent.
Larmine soils on slopes over 80 percent.
Atring soils on slopes over 80 percent.
Kilchis soils on slopes over 80 percent.
Harrington soils on slopes over 80 percent.
Chamate soils on slopes over 80 percent.
Shippa soils on slopes over 80 percent.

F. Harvesting

Clearcutting does not significantly increase erosion losses on most soils if the logs are yarded by a cable system. The American Forest Institute (1972) published an excellent review of the literature on the affects of clearcutting on the erosion of soils. They conclude their review with the summary statement; "Overall, logging alone is seen to be a relatively minor factor in man-caused erosion." Fredriksen (1970) found no rise in sediment yield from a watershed in which 30 percent of the area was clearcut and high-lead logged. In most logging operations most of the clearcut area is kept covered with vegetation.

Several soils in the District are exceptions to the rule that removal of the canopy has little affect on erosion losses. The Siskiyou and Shippa soils suffer some on-the-site degradation if they are clearcut. Soils of the series tend to develop small debris avalanches or "pop-outs" after a clearcut. The disturbed material moves only a short distance however, and does not adversely affect water quality where the clearcut areas are away from a stream channel. The scars from the "pop-outs" become covered with forbs, grasses, and shrubs in three to four years after they formed.

Removal of the canopy causes a particularly serious erosion problem in soils of the Holland and Siskiyou soils on slopes steeper than 70 percent, especially on northerly aspects. In these soils, clearcutting initiates small debris avalanches on the headwalls of drainage ways. Because of the steep slopes, the debris moves downslope and turns into a debris flow. Eventually the flow may scour the entire draw.

Clearcutting may trigger the debris avalanches in Holland and Siskiyou soils because of the affect canopy removal has on the rate and extent of saturating the sandy loam surface soil with water during high intensity rain storms. Holland soils have about 18 inches of sandy loam over a clay subsoil. The soils in the draws are generally more moist most of the year, than the soils on the sideslopes because of moisture received from lateral seepage. Therefore, when a high intensity storm occurs, the soils in the draws, which are already moist, soon become saturated and lose their coherent strength. The drier soils on the side-slopes do not become saturated as quickly and remain more stable. Removal of the canopy significantly speeds up the rate that the soils become saturated.

Siskiyou soils have a sandy loam texture from top to bottom. When they become saturated, they behave like Holland soils.

Regardless of the mechanism that causes debris avalanches to develop as a result of clearcutting on Holland and Siskiyou soils, the recommendation for overcoming this problem is to avoid clearcutting on headwalls with slopes steeper than 70 percent.

G. Slash Burning

Slash burning increases erosion losses for at least the first year after the burn, especially on steep slopes and for soils relatively low in organic matter content. South aspects appear to have more erosion losses than north aspects when all other factors are the same. Brown (1972) reported that in the Alsea Watershed, soils on slopes steeper than 80 percent produced signigicant amounts of sediment for one year after burning. Mersereau and Dyrness (1972), working on the H. J. Andrews Forest, measured soil movements of 87 cubic feet per acre per year on south slopes, and 23 cubic feet per acre per year on north slopes. Most of the soil movement was by dry ravel and was measured in boxes installed on the hillside. Much of the soil that moved probably did not leave the clearcut area.

Soils in the Roseburg District that are susceptible to accelerated surface erosion following slash burning include the shallow and moderately deep loamy-skeletal soils, and the sandy soils from granite when they occur on southerly aspects. The soils series with a definite erosion hazard as a result of severe slash burning when on southerly aspects are: Ritner (24), Kilches (35), Witzel (36), Jason (64), Digger (66), Zango (70), Beekman (371), Vermisa (372), Tarmine (393), Atring (394), Winberry (410), Umpcoos (564), Siskiyou (721), Holland (722), Pearsoll (770), Cornutt (710), and Skymor (825).

For centuries forest fires have caused the loss of certain nutrients by volatilizing, runoff, and erosion. Yet today, many old forests growing on burned over land are very productive. Several research papers (Brown, et. al., (1973); Fredriksen, (1970)), shed light on why the productivity remains high.

Nitrate nitrogen, potassium, and phosphorous were monitored in the Alsea study streams before and after logging. No change in any of these elements was observed in the watershed that was patchcut without burning. A four-fold increase in nitrate nitrogen loss was observed in a waterhsed that was completely logged and burned. Nitrate concentrations in the stream water were always less than 3 ppm. Annual loss for the first two years after logging and burning was about 15 pounds per acre (Brown, 1972, page 3). This loss represented no decrease to forest soil productivity. Potassium concentration in the water increased immediately after burning but quickly returned to prelogging levels. No increases of phosphorous in the runoff water were detected.

Fredriksen (1970) measured a loss of 2 pounds of nitrogen per acre, per year over a two-year period after slash burning from soils in the H. J. Andrews Forests. This loss was measured as dissolved nitrogen in stream runoff. This is very close to the amount of nitrogen added to the soil from rainfall.

Nutrient losses by volatilization appear to be more significant than losses by runoff. When organic matter is burned, about half the nitrogen, most of the organic sulfur and some of the organic phosphorous are lost.

Besides nitrogen being returned to the soil by rainwater, nitrogen is fixed by bacteria. A bacteria that lives symbiotically with ceanothus species can produce 750 pounds of nitrogen per acre over a 10-year period (Wollum, Youngberg, Chichester, 1968). The reader is referred to Scott (1973) for a discussion of factors that determine how much nitrogen will be fixed by Ceanothus velutinus. On steep south-facing shallow soils, ceanothus species do not occur in abundance. Therefore, the recovering of nitrogen losses on these soils is very slow.

Removal of trees during timber harvest is also a cause of nutrient loss from the ecosystem. A study in Washington (Cole, et. al., 1967) showed that about 10 percent of the available soil nitrogen in a Douglas-fir ecosystem was found in the tree. The bole and bark contained about 4 percent of the total available soil nitrogen. This amounted to 113 pounds/acre of nitrogen in the boles of 35-year-old Douglas-fir. Rainfall replaces about half of this amount over a 35-year period. The remaining replenishment comes from biological fixation. The majority of the nutrients in the tree were in the needles, twigs, branches, and roots. Most of this material remains on the site after logging.

H. Fertilizer Practices on Forests

Around 1950 work began in Washington to see what affect fertilizer had on stunted Douglas-fir trees. Since that time, fertilizer has been applied to trees in many different areas in the Pacific Northwest. This section is an attempt to summarize the state of the art of fertilizing forest soils.

1. Fertilizers

Fertilizing Douglas-fir with nitrogen produces a substantial increase in growth. Average response from 200 pounds of nitrogen per acre is a 30 percent increase in volume over a 5-year period (Figure 46).

Trees receiving nitrogen fertilizer show a greening up the first season after fertilizing. Nitrogen moves rapidly from the fertilizer in the soil into the roots and to the needles. Needles increase in length, width, and number.

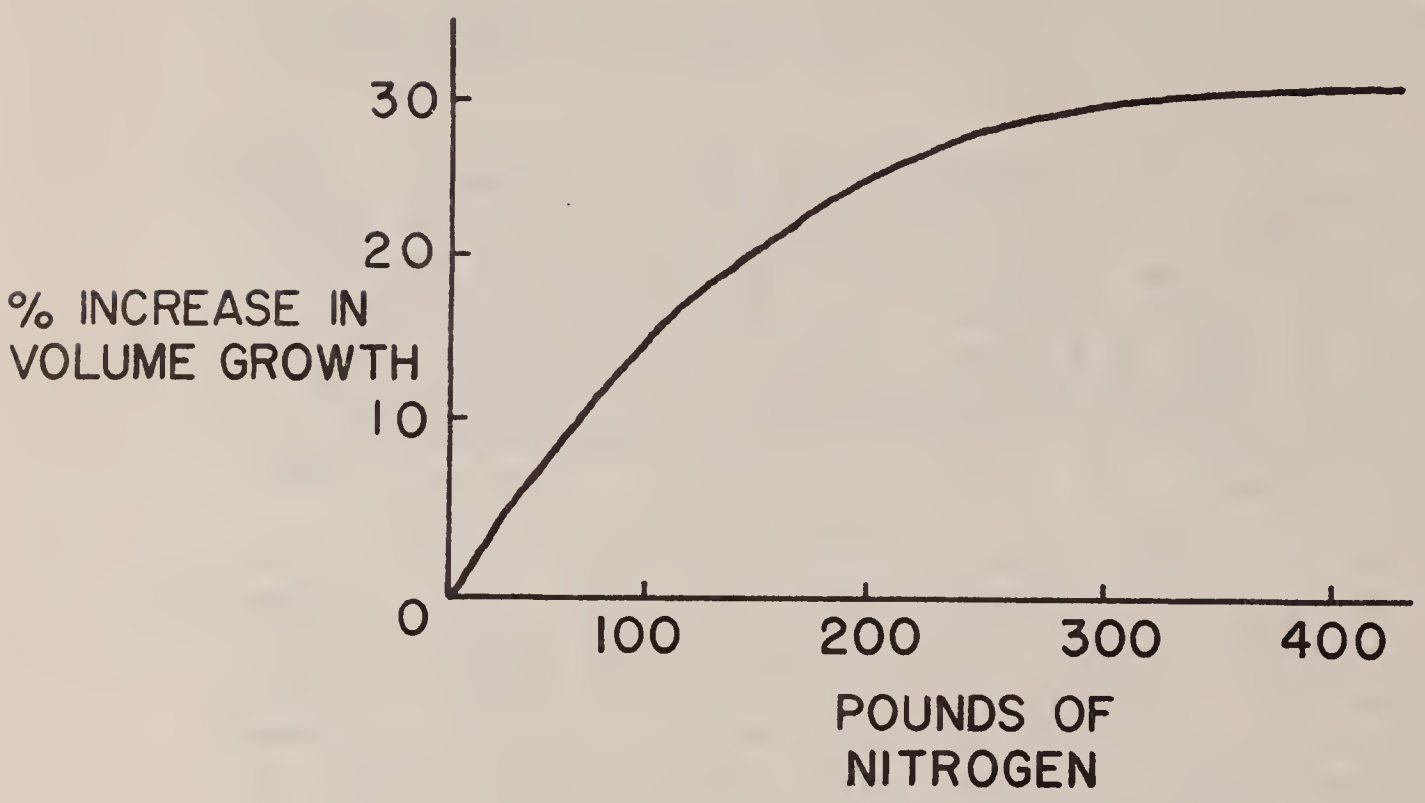


Figure 46. The relation of the increase in the volume of wood production to different rates of nitrogen fertilization.

Response from one application of fertilizer lasts from 5 to 7 years depending on the rate of application. The response starts the first year after fertilization, increases rapidly for the next 2 to 3 years, and then declines. Weyerhaeuser and Crown Zellerbach Timber Companies both recommend a 5-year refertilizing period. Crown Zellerbach Company's research has shown that 85 to 90 percent of the growth response is obtained in a 5-year period.

Prill urea is the most commonly used fertilizer. It contains 46 percent nitrogen. It is preferred over other solid fertilizers because of its high nitrogen content.

Trials with phosphorous and sulfur have shown that some soils are deficient in other elements besides nitrogen. Some plots in western Washington show a response to sulfur. Several other plots in the Roseburg area have shown a response to phosphorous. However, the response has not been great enough to warrant the cost of the extra phosphorous in the Roseburg District. The most reasonable rate of fertilizer is 200 pounds of nitrogen per acre. Response to nitrogen begins to level off between 150 to 300 pounds. Most commercial applications have been 200 pounds of nitrogen per acre.

Urea should be applied (see Figure 47) in the late fall, winter, or early spring. Warm moist weather causes some of the nitrogen in urea to escape as ammonia. Crown Zellerbach Company has shown that as much as 45 percent of the nitrogen can be volatilized.

Figure 47. Urea prill being applied at a rate of 200 pounds of nitrogen per acre below Mt. Scott.

One cannot make a single generalization about the response of Douglas-fir to fertilizer with respect to natural site index or soil type. The response results among various site classes are conflicting. Some studies show the greatest response was from low sites and others show the largest response from high sites. Still other studies indicate there is no apparent relationship between site index and response to fertilizer.

However, most studies show that nitrogen response occurs more consistently on site III and IV soils.

Table 17. The affect of nitrogen fertilizer on the increase in site index for five different natural site indices.

Site Index (Bul 201)		
Before Fert.	After Fert. with 200# N/A	% Increase in Site Index
100	160	60%
120	165	37
140	180	21
160	190	18
180	210	11

Trees between 15 to 90 years old are the most responsive. However, what age is optimum is unanswered. In general, stands between 15 to 30 years old are thought to be the most responsive. Crown Zellerbach Company showed a 20 percent decrease in response going from a 30-year-old stand to an 80-year-old stand when basal area was kept constant.

Water quality checks have been made on many streams in Oregon following fertilization. A review of these studies appeared in a recent article by Fredricksen et. al. (1975). The article states that regardless of size of area fertilized, location, or size of stream, the results are very similar. Urea and ammonia content of the stream increases slowly and reaches a maximum usually within two days after application. Nitrate nitrogen shows an increase after two days and usually peaks by the third day. Peak concentrations of any of these nitrogen compounds have not gone above the levels that are detrimental to human health.

The study showed that nitrate nitrogen stayed below 3.5 ppm. Urea nitrogen, however, did reach a peak of 8.5 ppm on Dollar Creek and 44.1 ppm on Nelson Creek for one day. Most of these increases came from direct fall into the stream.

At this time there is no maximum level set for nitrogen in water by the Oregon Water Quality standards. The U.S. Public Health Service has recommended a maximum level of 10 ppm nitrate and nitrite nitrogen. No levels of urea nitrogen have been set.

Currently, the Roseburg District is testing the use of liquid nitrogen. The liquid is 32 percent nitrogen applied as a spray. Preliminary results indicate that less nitrogen is needed in the liquid form than in the dry urea form to get the same response (Miller and Wert, 1974). Most of the liquid nitrogen falls on the canopy and is absorbed through the needles. Therefore, ground cover and organic matter in the soil have little opportunity to immobilize the nitrogen.

I. Reforestation

The success of restocking a particular area is dependent on a number of factors. These factors can be divided into environmental, biological and administrative. Table 18 is a list of these factors. Even though these factors do not act independently of one another, it is helpful to list the factors to realize the complexity of growing seedlings. The list also points out that soils are but one of many factors that will determine regeneration success.

Edgren (1972) stated that the most important combined effect of environmental factors is on the water economy of each site. He felt ". . . available moisture is the common denominator underlying a good many of the regeneration problems in Oregon and Washington."

An analysis of stocking surveys in this District supports Edgren's statement.

In 1973, first-year stocking surveys in the southwest part of the District were analyzed in an effort to quantify regeneration success (report on file in Roseburg Office, by Robert Lewis). Records were made of 13 factors that were thought to strongly influence tree survival. They were:

1. Aspect
2. Slope Gradient
3. Percent Natural Stocking
4. Unit Size
5. Contractor
6. Percent Penalty
7. Time Seedlings were in Storage
8. Frozen Damaged Stock
9. Lift-Pack Date
10. Planting Date
11. Seed Zone and Elevation
12. Spacing of Seedlings
13. Nursery Supplying Stock

Of this list, seven were run through a multiple regression and simple correlation analysis. The seven selected were:

1. Seed Zone and Elevation
2. Aspect
3. Slope Gradient
4. Percent Natural Stocking
5. Percent Penalty for Incorrectly Planted Trees
6. Frost Damaged Stock
7. Time Trees were in Storage

A multiple regression indicated that these variables were not important in explaining 1973 planting failures.

Table 18. Factors Affecting Regeneration Success

Environmental	Biological	Administrative
1. Aspect	1. Seed Source	1. Quality of Planting
2. % Slope	2. Condition of Seedlings At Lifting	2. Quality of Contract Inspection
3. Unit Size	a) Top-Root Ratio	3. Size of Planting Program
4. Water Holding Capacity of Soil	b) Degree of Hardening Off	4. Method of Shipping and Storage
5. % Natural Stocking	c) Time of Lifting	5. Access to Planting Units
6. Site Class	d) Weather Conditions During Lifting	
7. Radiation Load	3. Length of Seedling Storage	
8. Browsing		
9. Competition from Other Vegetation		
10. Frost		
11. Harvest Method		
12. Site Preparation		
13. Weather Before, During, and After Planting		

It was decided to compare percent stocking with soil water-holding capacity on the top 20 inches of the soil. Figure 48 shows a plotting of percent stocking versus water-holding capacity. The plotting indicates a strong positive correlation. Water-holding capacity was the most important factor that explained percent stocking over the entire area. Once this relationship was plotted, secondary factors explained why some of the points were above or below the "average" line.

For example, cooler north aspects generally fell above the line. Quality of planting, source of stock, and freeze-damaged stock were other secondary factors.

As was mentioned above, this analysis was made for the 1973 plantings. The summer of 1973 was unusually hot and dry. One would expect soil moisture to play a dominant role in tree survival in such a year. In more moist years, other factors could be the dominant factor and water-holding capacity would be secondary in affecting seedling survival or success.

A study (on file at Roseburg Office, Robert Lewis) used shingles to see if shade cast by them would increase survival. The study showed that shading with shingles did increase survival on soils with low water holding capacity. The shingles generally did not improve survival on soils that have a high water holding capacity. From this study and other observations, it appears that soils with a high water holding capacity on south aspects are difficult to reforest because of competition by other vegetation. Shade is not the answer to getting them stocked.

Listed below are the soils that have a low water holding capacity. They are the ones that require some type of shade and in some cases reduction in competition from grass and other vegetation to improve restocking success.

Kilchis (35)
Witzel (36)
Twindar gravelly overlay (53s)
Jason (64)
Zango (70)
Chamate (362)
Beekman (371)
Vermisa (372)
Larmine (393)
Atring (394)
Winberry (410)
Umpcoos (564)
Vena (731)
Shippa (732)
Pearsoll (770)
Skymor (825)

Effective control of vegetation is recommended on the following soils on southerly aspects to increase seedling survival.

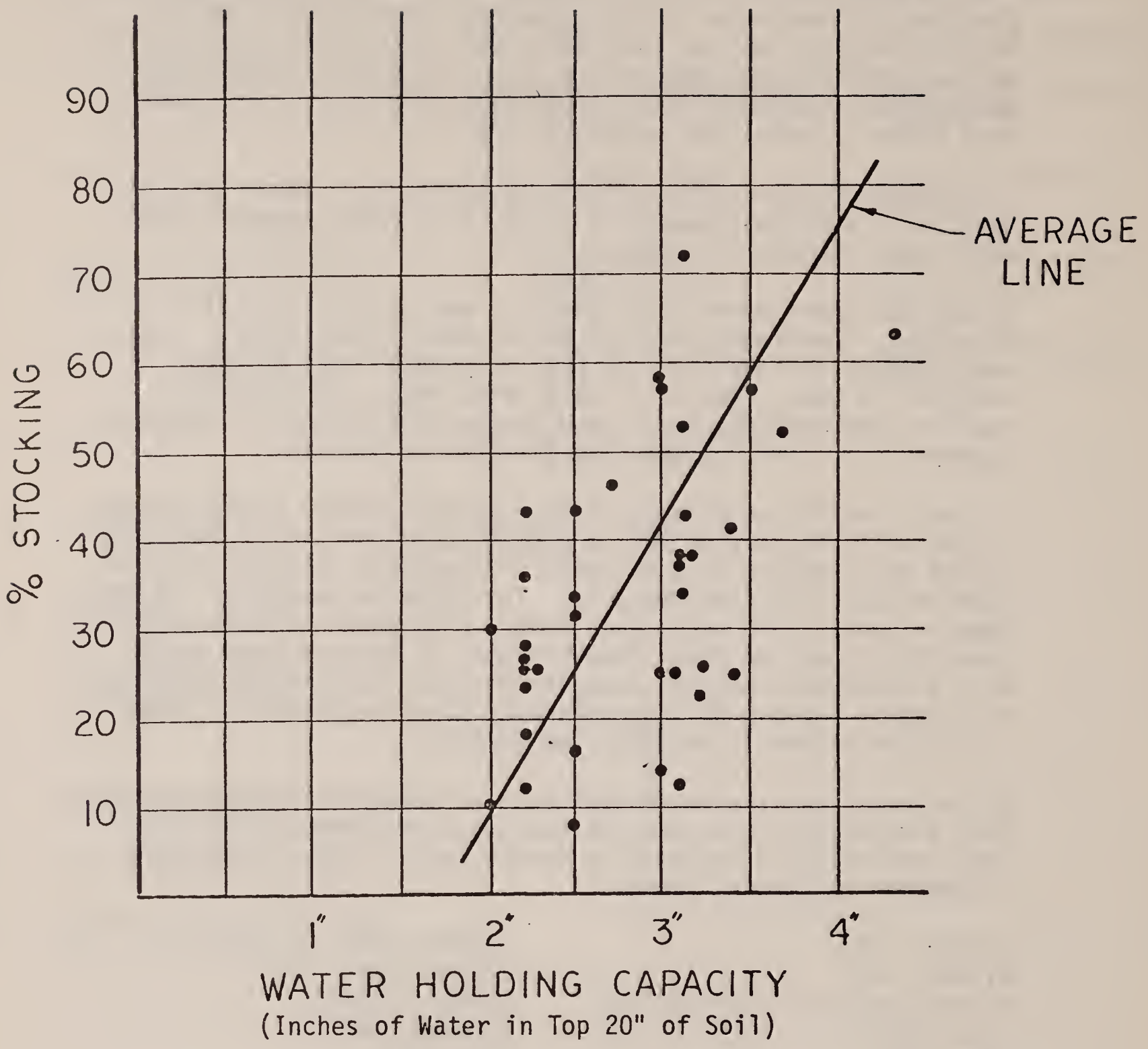


Figure 48. Relationship of soil water holding capacity and seedling survival.

Jory (12, 12x, 12t)
Nekia (23)
Ritner (24)
Abegg (360)
Kanid (370)
Pollard (380)
McGinnis (381)
Tishar (382)
Renhaven (395)
Bateman (396, 396t)
Darby (397)
Siskiyou (721)
Holland (722, 722m)
Barron (723)
Lettia (724, 724m)
Freezner (741)
Jayar (824)

These recommendations are very broad. They point out that moisture-holding capacity is an important consideration in planning timber rehabilitation. They can guide, in a general way, how a clearcut may be treated to improve survival of Douglas-fir seedlings.

J. Recreation

In this section, the limitations of soils in the inventory area are discussed for specified recreational uses including camp areas, park-type picnic areas, and trails. Also, soil ratings are given for septic tank filter field limitations and sanitary landfills.

The ratings used are slight, moderate, and severe. Ratings are based on soil properties and qualities only and do not include other features such as location, size of area, and availability of water that may be important in site selection and development. On-site investigations are necessary.

The various recreation uses of the soils are defined in the paragraphs that follow and the properties important in rating the limitation of the soils for such purposes are given. The ratings are in Table 19.

1. Camp Areas

Camping areas require little site preparation other than minor shaping and leveling of areas used for tents and parking. The soils must be able to support heavy foot traffic and limited vehicular traffic.

Soil suitability for growing and maintaining vegetation is not a part of this guide but is an item to consider in final evaluation of a site. The problems of water supply, sewage disposal, or access roads were not considered in the rating.

A soil has slight limitations for campsites if all of the following features apply: Slopes are less than 8 percent; drainage is somewhat excessive, well, or moderately well;

depth to the seasonal water table is more than 30 inches; there is no flooding; permeability is rapid, moderately rapid, or moderate; surface soil texture is sandy loam, silt loam or loam; soil depth is 20 inches or more; gravel covers less than 20 percent of the surface area; stones cover less than 0.1 percent of the area; rock outcrop covers less than 2 percent of the area.

A soil that has a moderate limitation for campsites has one or more of the following features: Slopes are 8 to 15 percent; drainage is somewhat poor; depth to the seasonal water table is 20 to 30 inches; flooding does not occur during season of use; permeability is moderately slow or slow; the surface soil texture is clay loam, sandy clay loam, silty clay loam, or loamy sand; soil depth to rock is bewteen 10 and 20 inches; gravel covers between 20 and 50 percent of the surface area; stones cover between 0.1 and 3 percent of the surface area; rock outcrops cover from 2 to 25 percent of the area.

A soil has severe limitations for campsites if one or more of the following features apply: Slopes are more than 15 percent; depth to seasonal water table is less than 20 inches, flooding occurs during season of use; permeability is very slow; the surface texture is silty clay, sandy clay, clay or loose sand; depth to rock is less than 10 inches; gravel covers over 50 percent of the surface area; stones cover more than 3.0 percent of the surface area; rock outcrops cover more than 25 percent of the surface area.

2. Picnic Areas

Picnic areas require little site preparation other than minor shaping and leveling of areas for picnic tables. The soils must be able to support heavy traffic by people.

Soil suitability for growing vegetation is not a part of this guide, but is an item to consider in final evaluation of a site. Problems of water supply and sewage disposal are not considered in the ratings. Most vehicular traffic will be confined to access roads.

A soil has slight limitations for picnic areas if all of the following features apply: Slopes are less than 8 percent; the drainage class is moderately well, well, or somewhat excessive; seasonal water tables are deeper than 20 inches; flooding does not occur during season of use; surface soil texture is sandy loam, fine sandy loam, silt loam or loam; gravel covers less than 20 percent of the surface area; stones and rocks cover less than 3 percent of the surface area.

Table 19. Soil Interpretations for Recrational Uses of the Soils

Map Symbol	Soil Name	Slope Percent	Degree of Limitation for:			
			1 Camp Areas	2 Picnic Areas	3 Paths & Trails	4 Septic Tank Drain Field
10	Blachy	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		> 25	severe	severe	severe	severe
12, 12x, 12t	Jory	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		> 25	severe	severe	severe	severe
13	Bellpine	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	severe
		> 25	severe	severe	severe	severe
14x, 14t	Honeygrove	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		> 25	severe	severe	severe	severe
19	Cruiser	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		> 25	severe	severe	severe	severe
20x, 20t	Peavine	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	severe
		> 25	severe	severe	severe	severe

Table 19. Soil Interpretations for Recreational Uses of the Soils

Map Symbol	Soil Name	Slope Percent	Degree of Limitation for: 1 Camp Areas	2 Picnic Areas	3 Paths & Trails	4 Septic Tank Drain Field
23	Nekia	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	severe
		>25	severe	severe	severe	severe
24	Ritner	60-90	N. A.	N. A.	severe	N. A.
29	Harrington	0-10	slight	slight	slight	slight
		10-25	severe	moderate	moderate	slight
		>25	severe	severe	severe	severe
35	Kilchis	60-90	N. A.	N. A.	severe	N. A.
36	Witzel	60-90	N. A.	N. A.	severe	N. A.
50	Apt	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	-
		> 25	severe	severe	severe	severe
53,53s	Twindar	50-70	N. A.	N. A.	severe	N. A.
57	Preacher	0-10	slight	slight	slight	slight
		10-25	severe	moderate	moderate	slight
		> 25	severe	severe	severe	severe

Table 19. Soil Interpretations for Recreational Uses of the Soils

Map Symbol	Soil Name	Slope Percent	Degree of Limitation for:			
			1 Camp Areas	2 Picnic Areas	3 Paths & Trails	4 Septic Tank Drain Field
64	Jason	60-90+	N. A.	N. A.	severe	N. A.
66	Digger	60-90+	N. A.	N. A.	severe	N. A.
70	Zango	60-90+	N. A.	N. A.	severe	N. A.
300	Shivigny	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		>25	severe	severe	severe	severe
323	Klickitat	50-70	N. A.	N. A.	severe	N. A.
360	Abegg	50-70	N. A.	N. A.	severe	N. A.
362	Chamate	0-10	slight	moderate	slight	severe
		10-25	severe	severe	moderate	severe
		>25	severe	severe	severe	severe
370	Kanid	0-10	slight	slight	slight	slight
		10-25	severe	moderate	moderate	slight
		>25	severe	severe	severe	severe
371	Beekman	50-70	N. A.	N. A.	severe	N. A.
372	Vermisa	60-90	N. A.	N. A.	severe	N. A.

Table 19. Soil Interpretations for Recreational Uses of the Soils

Map Symbol	Soil Name	Slope Percent	Degree of Limitation for:			
			1 Camp Areas	2 Picnic Areas	3 Paths & Trails	4 Septic Tank Drain Field
380	Pollard	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		> 25	severe	severe	severe	severe
381	McGinnis	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	severe
		> 25	severe	severe	severe	severe
382	Tishar	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		> 25	severe	severe	severe	severe
393	Larmine	60-90+	N. A.	N. A.	severe	N. A.
394	Atring	50-70	N. A.	N. A.	severe	N. A.
395	Renhaven	0-10	slight	slight	slight	slight
		10-25	severe	moderate	moderate	slight
		> 25	severe	severe	severe	severe
396,396t	Bateman	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		> 25	severe	severe	severe	severe

Table 19. Soil Interpretations for Recreational Uses of the Soils

Map Symbol	Soil Name	Slope Percent	Degree of Limitation for:			
			1 Camp Areas	2 Picnic Areas	3 Paths & Trails	4 Septic Tank Drain Field
397	Darby	0-10	slight	moderate	slight	severe
		10-25	severe	moderate	moderate	severe
		>25	severe	severe	severe	severe
400	Holderman	50-70	N. A.	N. A.	severe	N. A.
410	Winberry	60-90+	N. A.	N. A.	severe	N. A.
564	Umpcoos	>80	N. A.	N. A.	severe	N. A.
721	Siskiyou	50-70	N. A.	N. A.	severe	N. A.
722,722m	Holland	25-50	N. A.	N. A.	severe	N. A.
724,724m	Lettia	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		25-50	severe	severe	severe	severe
731	Vena	50-70	N. A.	N. A.	severe	N. A.
732	Shippa	70-90+	N. A.	N. A.	severe	N. A.
741	Freezner	0-10	slight	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		25-50	severe	severe	severe	severe

Table 19. Soil Interpretations for Recreational Uses of the Soils

Map Symbol	Soil Name	Slope Percent	Degree of Limitation for:			
			1 Camp Areas	2 Picnic Areas	3 Paths & Trails	4 Septic Tank Drain Field
743	Selmac	0-10	moderate	moderate	slight	moderate
		10-25	severe	moderate	moderate	moderate
		25-50	severe	severe	severe	severe
770	Pearsoll	60-90+	N. A.	N. A.	severe	N. A.
771	Cornutt	50-70	N. A.	N. A.	severe	N. A.
824	Jayar	50-70	N. A.	N. A.	severe	N. A.
825	Skymor	60-90	N. A.	N. A.	severe	N. A.
R	Rockland'	80-100	N. A.	N. A.	N. A.	N. A.

A soil that has moderate limitations for use as a picnic area has one or more of the following features: Slopes are 8 to 15 percent; the drainage class is somewhat poor and the depth to a seasonal water table may be less than 20 inches for short period during the season of use; surface soil textures are sandy clay loam, clay loam, sandy clay, silty clay loam, or loamy sand; gravel covers from 20 to 50 percent of the area; stones and rocks cover from 3 to 15 percent of the surface area.

A soil has severe limitations for picnic areas if one or more of the following features apply: Slopes are more than 15 percent; the drainage class is poorly drained and the water table is above 20 inches for a month or more during the season of use; flooding occurs more than twice during the season of use; the surface soil texture is sandy clay, silty clay, clay, or loose sand; gravel covers more than 50 percent of the surface area; stones and rocks cover 15 percent of the surface area.

3. Paths and Trails

The chief requirement for such areas is good trafficability. The areas are assumed to be for use as they occur in nature and little soil will be moved.

The path and trail ratings are based on soil properties and qualities only. They do not take into account other features, such as aesthetic value, that would make the path site desirable but would require more preparation and maintenance.

A soil has slight limitations for paths and trails if all of the following features apply: Slopes are 0 to 15 percent; drainage is somewhat excessive, well, or moderately well, and the depth to a seasonal water table is more than 20 inches; floods occur no more than once a year during the season of use; surface textures are sandy loam, fine sandy loam, loam, or silt loam; gravel covers less than 20 percent of the surface area; stones cover less than 0.01 percent of the area; rock outcrops cover less than 10 percent of the area.

A soil that has moderate limitations for paths and trails has one or more of the following features: Slopes range from 15 to 30 percent; drainage is somewhat poor; floods occur 2 or 3 times during each season of use; surface soil texture is silty clay loam, sandy clay loam, clay loam, or loamy sand; gravel covers from 20 to 50 percent of the surface area; stones cover from 0.01 to 3.0 percent of the area; rock outcrops cover from 10 to 25 percent of the area.

A soil has severe limitations for paths and trails if one or more of the following features apply: Slopes are more than 30 percent; drainage is poor or very poor; floods occur more than 3 times during each season of use; surface soil textures are sandy clay, silty clay, clay, or sand; gravel covers more than 50 percent of the surface area; stones cover more than 3.0 percent of the surface area; rock outcrops cover more than 25 percent of the area.

4. Septic Tank Drainfield

The term septic tank drainfield refers to a sewage disposal system in which waste is distributed to a central tank and the effluent from the tank is dispersed over a fairly large area of filter field lines buried in the soil. Sites developed for camping, picnicing, and playgrounds ordinarily require some form of an independent sewage disposal system. These ratings also apply to any disposal fields, such as waste water, in addition to sewage disposal systems.

It is assumed that the minimum depth of soil over the tile lines is 12 inches and that the diameter of the lines is 4 inches. The soil limitation ratings for this use are based on soil properties and qualities only. Coarse-textured soils, for example, may permit contamination of water supplies. Water, required for the system, may not be readily available at the site.

A soil has slight limitations for filter fields if all of the following features apply: Permeability is more than 1.0 inch per hour, or the percolation rate is faster than 45 minutes per inch of drop in water level; depth to seasonal water table is more than 6 feet; drainage is somewhat excessive or well; depth to impervious bedrock or permanent water is more than 6 feet; slope is between 0 and 8 percent; flooding never occurs.

A soil that has a moderate limitation for septic tank filter fields has one or more of the following features: Permeability is between 1.0 and 0.63 inches per hour, or the percolation rate is between 45 and 75 minutes per inch; depth to a seasonal water table is between 4 and 6 feet; drainage class is moderately well or somewhat poor; depth to impervious bedrock or permanent water table is between 4 and 6 feet; slopes range from 8 to 15 percent; floods occur less than once in 10 years; the duration of overflow is 48 hours or less.

A soil has severe limitations for this use if one or more of the following apply: Permeability is less than 0.63 inches per hour or the percolation rate is lower than 75 minutes per inch of drop in water level; depth to seasonal water table is less than 4 feet; drainage is less than somewhat poor; depth to impervious bedrock or permanent water table is less than 4 feet; slope is more than 15 percent; floods occur 1 or more times in a 10-year period; the duration of any overflow is more than 48 hours.

K. Selected Soil Properties and Qualities

Table 20 gives ratings for certain soil properties and qualities. The criteria used for each soil property are discussed below.

1. Soil Depth

Depth classification is especially significant for effective root depth, mechanical treatment and water holding capabilities that are necessary for plant growth. There are four soil depth classes.

Class	Depth in Inches
Deep	40 plus
Moderately Deep	20-40
Shallow	10-20
Very Shallow	0-10

2. Permeability

Soil permeability is that quality of the soil that enables it to transmit water and air. Accepted as a measure of this quality is the rate at which soil will transmit water under saturated conditions.

The following classes are used to rate soil permeability:

Class	Rate in Inches per Hour
Very Slow	Less than 0.063
Slow	0.063 to 0.20
Moderately Slow	0.20 to 0.63
Moderate	0.63 to 2.00
Moderately Rapid	2.00 to 6.30
Rapid	6.30 to 20.00
Very Rapid	Over 20.00

3. Drainage Class

Soil drainage, as a quality of the soil, refers to the frequency and duration of periods when the soil is free of saturation or partial saturation. Soil drainage classes are determined by observations and inferences used to obtain classes of permeability. These classes are based on those morphological characteristics that are affected by aeration within the soil profile.

a. Very Poorly Drained

Water table remains at or near the surface a greater part of the time. Field evidences of very poor drainage are level or depressed areas, presence of water table above 18 inches, a peaty or mucky surface horizon.

b. Poorly Drained

Soil remains wet much of the time with the water table near the surface for prolonged intervals. Field evidences are the presence of a high water table (at depths of 18 to 36 inches) and mottles within 20 inches of the surface. Soils usually lack peaty or mucky surface horizons. Drainage is necessary for growth of important plants. Grazing is possible most of the time. Commercial timber production of conifer species is poor to fair.

c. Somewhat Poorly Drained

Soil is wet for significant periods, usually because of a slowly permeable layer or a high water table. Field evidences are the presence of a water table at depths of 36 to 60 inches, mottles within 20 to 36 inches of the surface, and unusually thick and dark A horizons.

d. Moderately Well Drained

Soil is wet for a small but significant part of the time, usually because of a slowly permeable layer within or immediately beneath the soil and an intermittently high water table, usually below 5 feet.

e. Well Drained

Soils are free of mottling, at least within the usual depth of plant roots. Commercial timber production is good.

Table 20. Selected Soil Properties and Qualities

Map Symbol	Soil Name	Class			Annual Precipitation (inches)	Reaction Range (pH)	Hydrologic Group	Available Water Holding Capacity	
		Depth	Permeability	Drainage				Over bedrock	Over very rotten rock
10	Blachly	deep	moderate	well	50-80		C	8	11
12, 12x, 12t	Jory	deep	mod. slow	well	35-50	5.4-6.0	C	8	11
13	Bellpine	mod.deep	mod. slow	well	35-50	5.4-5.8	C	6	11
14x, 14t	Honeygrove	deep	mod. slow	well	50-70	5.6-6.4	C	8	11
19	Cruiser	deep	moderate	well	60-80	5.2-5.8	C	8	11
20x, 20t	Peavine	mod.deep	mod. slow	well	50-70	6.2-6.4	C	6	11
23	Nekia	mod.deep	mod. slow	well	35-50		C	6	11
24	Ritner	mod.deep	mod. slow	well	35-50	6.6-6.8	C	4	7
29	Harrington	mod.deep	mod. rapid	well	50-70	5.2-5.6	B	4	6
35	Kilchis	shallow	rapid	somewhat excessively	50-70		D	1.5	6
36	Witzel	shallow	mod. rapid	well	35-50	6.6-6.9	D	2	6
50	Apt	deep	mod. slow	well	50-70	5.6-6.0	C	8	11
53	Twindar	mod.deep	rapid	well	50-70	5.8-6.0	B	4	8
53s	Twindar (gravel overlay phase)	mod.deep	rapid	well	50-70	6.4-6.6	B	2	8
57	Preacher	deep	moderate	well	50-70	5.6-6.4	B	11	14
64	Jason	shallow	rapid	somewhat excessive	50-70	6.2-6.4	D	1.5	7

Table 20. Selected Soil Properties and Qualities

Map Symbol	Soil Name	Class			Annual Precipitation (inches)	Reaction Range (pH)	Hydrologic Group	Available Water Holding Capacity	
		Depth	Permeability	Drainage				Over bedrock	Over very rotten rock
66	Digger	mod.deep	mod. rapid	well	50-70	6.0-6.4	B	5	9
70	Zango	shallow	rapid	somewhat excessive	50-70	5.4-5.6	D	1.5	7
300	Shivigny	deep	mod. slow	well	50-70	6.2-6.8	C	8	10
323	Klickitat	deep	mod. rapid	well	50-70	5.2-5.6	B	5	8
360	Abegg	deep	mod. rapid	well	30-50	6.4-6.8	B	5	8
362	Chamate	deep	rapid	well	35-50	6.4-6.8	B	4	6
370	Kanid	deep	moderate	well	30-50	5.5-6.6	B	7	9
371	Beekman	mod.deep	mod. rapid	excessive	30-50	5.5-6.0	B	4	8
372	Vermisa	shallow	rapid	somewhat excessive	30-50	6.5-7.0	D	2	7
380	Pollard	deep	mod. slow	well	30-50	5.8-6.5	C	8	10
381	McGinnis	mod.deep	mod. slow	well	30-50	5.4-6.5	C	4	7
382	Tishar	deep	mod. slow	well	30-50	5.0-6.0	C	6	7
393	Larmine	shallow	rapid	excessive	35-50	5.6-6.6	D	2	7
394	Atring	mod.deep	mod. rapid	well	35-50	6.0-6.4	B	5	9
395	Renhaven	deep	moderate	well	35-50	5.8-6.0	B	10	13
396, 396t	Bateman	deep	mod. slow	well	35-50	5.2-5.6	C	9	11

Table 20. Selected Soil Properties and Qualities

Map Symbol	Soil Name	Class			Annual Precipitation (inches)	Reaction Range (pH)	Hydrologic Group	Available Water Holding Capacity	
		Depth	Permeability	Drainage				Over bedrock	Over very rotten rock
397	Darby	deep	slow	well	30-50	6.4-7.0	C	9	11
400	Holderman	mod.deep	mod. rapid	excessive		5.2-5.4	B	4	8
410	Winberry	shallow	rapid	excessive		5.2-5.4	D	1.5	7
564	Umpcoos	shallow	very rapid	somewhat excessive	60-70	5.6-6.0	D	2	-
721	Siskiyou	mod.deep	mod. rapid	excessive	30-40	5.8-6.0	B	3.0	5.0
722, 722m	Holland	deep	moderate	well	30-40	5.6-6.0	B	-	-
723	Barron	deep	mod. rapid	excessive	30-40	5.0-6.8	B	4.0	5.0
724, 724m	Lettia	deep	mod. slow	well	30-40	5.4-6.6	C	8	10
731	Vena	mod.deep	mod. rapid	excessive	30-50	5.2-5.6	B	3	6
732	Shippa	shallow	rapid	somewhat excessive	30-50	6.0-6.4	D	1.5	6
741	Freezner	deep	mod. slow	well	30-50	5.0-5.4	C	7	10
743	Selmac	deep	slow	mod. well	30-50	5.0-6.8	C	7	10
770	Pearsoll	shallow	mod. rapid	somewhat excessive	30-40	6.5-7.0	D	-	-
771	Cornutt	mod.deep	mod. slow	well	30-40	6.8-8.2	C	-	-
824	Jayar	mod.deep	moderate	well	50-60	5.4-5.8	B	5	9
825	Skymor	shallow	rapid	somewhat excessive	50-60	5.5-5.8	D	2	7

f. Somewhat Excessively Drained

Water is removed from these soils rapidly. Soils may be very shallow or shallow, and are coarse textured and very porous. Soils are similar in color to well-drained soils. Soils are droughty.

g. Excessively Drained

Water is removed from these soils very rapidly. Soils are commonly composed of sands and gravels and are very porous.

4. Precipitation

Data from the Isohyetal Map, Normal Annual Precipitation, Douglas County, Oregon; U. S. Army Corps of Engineers, Portland Office, was the source of this information.

5. Reaction Range

Reaction is the degree of acidity or alkalinity of a soil expressed in pH values. Reaction range shows highest and lowest pH in the total soil profile without reference to any particular layer or depth.

Reaction Description	pH Range
Extremely acid	Below 4.5
Very strongly acid	4.5 - 5.0
Strongly acid	5.1 - 5.5
Medium acid	5.6 - 6.0
Slightly acid	6.1 - 6.5
Neutral	6.6 - 7.3
Mildly alkaline	7.4 - 7.8
Moderately alkaline	7.9 - 8.4
Strongly alkaline	8.5 - 9.0
Very strongly alkaline	Above 9.0

6. Hydrologic Soil Groups

Hydrologic soil groups are used in watershed planning to estimate runoff from rainfall. Soil properties are considered that influence the minimum rate of infiltration obtained for a bare soil after prologned wetting. These properties are depth of seasonally high water table, intake rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The influence of ground cover on runoff and infiltration is not considered in hydrologic soil groups. Soils are classified into four groups: A, B, C and D.

Group A soils have a low runoff potential. They include soils having high infiltration rates even when thoroughly wetted and consist chiefly of deep, well to excessively drained sands and gravels. There are no group A soils in the inventory area.

Group B soils have a moderately low runoff potential. These are soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep, moderately well and well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Group C soils have a moderately high water runoff potential. These are soils having slow infiltration rates when thoroughly wetted and consisting chiefly of well drained and moderately well drained soils with slowly and very slowly permeable layers at moderate depths (20 to 40 inches) and soils with moderately fine to fine textures.

Group D soils have a high runoff potential. These are soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, and soils with a nearly impervious layer at depths of less than 20 inches.

7. Available Water Holding Capacity

Available water holding capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants. It depends largely on effective depth, texture, organic matter content and coarse fragment content. In general, profiles that contain fifty percent coarse fragments by volume will have only one-half of the moisture-holding capacity of a comparable soil that is free of coarse fragments.

VII. SOIL CLASSIFICATION AND MORPHOLOGY

A. Soil Classification

Soils are classified to systematically assemble knowledge about them and to draw general conclusions that help us understand their behavior and their response to soil management practices. Without soil classification, there is no orderly or systematic way to organize our knowledge about soil behavior and capabilities.

To accommodate the several degrees of detail required in planning and implementing land use and management practices, the current system of soil classification has six categories. Beginning with the most general, or most broadly defined, these categories are order, suborder, great group, subgroup, family and series. The soil map in this report consists of mapping units defined in terms of soil series.

The classification of the soil series in the family, subgroup and order categories is given in Table 21 for the Roseburg District. The great group and suborder categories are also present in this table but as part of the subgroup names. The last word of the subgroup name is the name of the great group, and the last two syllables of the great group is the name of the suborder. For example, for the subgroup Typic Dystrochrepts, the great group is Dystrochrepts and the suborder is Ochrepts. The last syllable of the suborder is a portion of the name of the order; in this case being "ept" from Inceptisols.

B. Description of Soil Series by Subgroups

The 47 soil series of the Roseburg District are classified into 18 subgroups. The 18 subgroups are distributed among 10 great groups, six suborders and four orders. A discussion of the major distinguishing characteristics of the subgroups is given in this section. The subgroups are listed alphabetically, first by order, second by suborder, third by great group, and finally by subgroup.

Subgroups of Alfisols

Ultic Haploxeralfs. This is the only subgroup of Alfisols represented in the Roseburg District. Soils of the Abegg, Bateman, Cornutt, Freezner, Holland, Lettia and Selmac series are in this subgroup. These soils have a surface horizon that is relatively light colored, thin, and low in organic matter (ochric horizon), overlying a subsoil enriched in clay by illuviation (argillic horizon), and have a base saturation of 35% or more. The Xeralfs are Alfisols that are dry between depths of about four and twelve inches for at least 45 consecutive days in the period of June 21 and September 21. The Ultic Haploxeralfs have a base saturation of less than 75 percent in some part or all of the upper 30 inches of the argillic horizon.

TABLE 21 Classification of the Soil Series

Symbol	Series	Depth (Inches)	Family	Subgroup	Order
10	Blachly	40-60+	Fine, mixed, mesic	Typic Dystrochrepts	Inceptisols
12	Jory	40-60+	Clayey, mixed, mesic	Xeric Haplohumults	Ultisols
13	Bellpine	20-40	Clayey, mixed, mesic	Xeric Haplohumults	Ultisols
14	Honeygrove	40-60+	Clayey, mixed, mesic	Typic Haplohumults	Ultisols
19	Cruiser	40-60	Fine-loamy, mixed, frigid	Andic Cryochrepts	Inceptisols
20	Peavine	20-40	Clayey, mixed, mesic	Typic Haplohumults	Ultisols
23	Nekia	20-40	Clayey, mixed, mesic	Xeric Haplohumults	Ultisols
24	Ritner	20-40	Clayey-skeletal, mixed, mesic	Dystric Xerochrepts	Inceptisols
29	Harrington	20-40	Loamy-skeletal, mixed, mesic	Typic Haplumbrepts	Inceptisols
35	Kilchis	10-20	Loamy-skeletal, mixed, mesic	Lithic Haplumbrepts	Inceptisols
36	Witzel	10-20	Loamy-skeletal, mixed, mesic	Lithic Ultic Haplp-xerolls	Mollisols
50	Apt	40-60+	Clayey, mixed, mesic	Typic Haplohumults	Ultisols
53	Twindar	20-40	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols
57	Preacher	40-60+	Fine-loamy, mixed, mesic	Typic Haplumbrepts	Inceptisols
64	Jason	10-20	Loamy-skeletal, mixed mesic, shallow	Dystric Eutrochrepts	Inceptisols
66	Digger	20-40	Loamy-skeletal, mixed, mesic	Dystric Eutrochrepts	Inceptisols
70	Zango	10-20	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols

TABLE 21 Classification of the Soil Series (cont.)

Symbol	Series	Depth (Inches)	Family	Subgroup	Order
300	Shivigny	40-60	Clayey-skeletal, mixed, mesic	Typic Haplohumults	Ultisols
323	Klickitat	40-60	Loamy-skeletal, mixed, mesic	Typic Haplumbrepts	Inceptisols
360	Abegg	40-60	Loamy-skeletal, mixed, mesic	Ultic Haploxeralfs	Alfisols
362	Chamate	40-60	Loamy-skeletal, mixed, mesic	Typic Xerochrepts	Inceptisols
370	Kanid	40-60	Loamy-skeletal, mixed, mesic	Dystric Xerochrepts	Inceptisols
371	Beekman	20-40	Loamy-skeletal over fragmented, mixed, mesic	Dystric Xerochrepts	Inceptisols
372	Vermisa	10-20	Loamy-skeletal, mixed, mesic	Lithic Xerochrepts	Inceptisols
380	Pollard	40-60	Clayey, mixed, mesic	Typic Haploxerults	Ultisols
381	McGinnis	20-40	Clayey-skeletal, mixed, mesic	Typic Haploxerults	Ultisols
382	Tishar	40-60	Clayey-skeletal, mixed, mesic	Typic Haploxerults	Ultisols
393	Larmine	10-20	Loamy-skeletal, mixed, mesic	Lithic Xerochrepts	Inceptisols
394	Atring	20-40	Loamy-skeletal, mixed, mesic	Typic Xerochrepts	Inceptisols
395	Renhaven	40-60	Fine-loamy, mixed, mesic	Dystric Xerochrepts	Inceptisols
396	Bateman	40-60	Fine, mixed, mesic	Ultic Haploxeralfs	Alfisols
397	Darby	40-60	Fine, mixed, mesic	Pachic Ultic Argixerolls	Mollisols
400	Holderman	20-40	Loamy-skeletal, mixed, frigid	Dystric Cryochrepts	Inceptisols
410	Winberry	10-20	Loamy-skeletal, mixed, frigid	Lithic Cryochrepts	Inceptisols

TABLE 21 Classification of the Soil Series (cont.)

Symbol	Series	Depth (Inches)	Family	Subgroup	Order
564	Umpcoos	10-20	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols
721	Siskiyou	20-40	Coarse-loamy, mixed, mesic	Typic Xerochrepts	Inceptisols
722	Holland	40-60	Fine-loamy, mixed, mesic	Ultic Haploxeralfs	Alfisols
723	Barron	40-60	Coarse-loamy, mixed, mesic	Typic Xerochrepts	Inceptisols
724	Lettia	40-60	Fine, mixed, mesic	Ultic Haploxeralfs	Alfisols
731	Vena	20-40	Loamy-skeletal, mixed, mesic	Dystric Xerochrepts	Inceptisols
732	Shippa	10-20	Loamy-skeletal, mixed, mesic	Dystric Lithic Xerocrepts	Inceptisols
741	Freezner	40-60	Fine, mixed, mesic	Ultic Haploxeralfs	Alfisols
743	Selmac	40-60	Fine-loamy over Clayey, mixed mesic	Ultic Haploxeralfs	Alfisols
770	Pearsoll	10-20	Clayey-skeletal, serpentinitic, mesic	Lithic Xerochrepts	Inceptisols
771	Cornutt	20-40	Fine, serpentinitic, mesic	Ultic Haploxeralfs	Alfisols
824	Jayar	20-40	Loamy-skeletal over fragmental, mixed, frigid	Dystric Xerochrepts	Inceptisols
825	Skymor	10-20	Loamy-skeletal over fragmental, mixed, frigid	Dystric Xerochrepts	Inceptisols

They are intergrading toward the Ultisols, which are more strongly weathered and leached than the Alfisols.

Subgroups of Inceptisols

Andic Cryochrepts. The Cruiser soils are the only series in this subgroup. The Inceptisols commonly have weakly developed subsoil horizons that have been altered by weathering and leaching, but which lack enrichment by illuviation in clays. The Ochrepts have a light-colored, or relatively thin dark-colored surface horizon (ochric horizon). The Cryochrepts are the cold Ochrepts of high elevations. Their mean annual temperature at a depth of 20 inches is lower than 8^{o} C (47^{o} F), and their summer temperature is also relatively cool, lower than 15^{o} C (59^{o} F). The Andic Cryochrepts are influenced by volcanic ash, and therefore at least one-fourth of the upper 30 inches has a bulk density of 0.95 g/cc or less.

Dystric Cryochrepts. The moderately deep, very gravelly or very cobbly soils of the Holderman series are the only ones in this subgroup. The Holderman soils have relatively light-colored (ochric) surface horizon, a weakly developed (cambic) subsoil horizon, and are cold soils at high elevations having cool summer temperatures. The Dystric Cryochrepts are not influenced by volcanic ash and have a base saturation of 60 percent or less in all layers above 30 inches. Plant growth is mainly restricted by a short frost-free period and cool summer temperatures in the root zone.

Lithic Cryochrepts. The shallow, very gravelly or very cobbly soils of the Winberry series are in this subgroup. They are associated with the moderately deep Holderman soils in the Dystric Cryochrepts subgroup and differ from these in that they are less than 20 inches thick over hard volcanic bedrock. Plant growth is limited by both cold temperatures and a low moisture supplying capacity.

Lithic Dystrochrepts. The Umpcoos and Zango soils are in this subgroup. The Dystrochrepts are at lower elevations than the Cryochrepts, and therefore have mean annual soil temperatures higher than 8^{o} C (47^{o} F) at a depth of 20 inches. Also, Dystrochrepts are acid soils of humid regions that are not dry for as long as 45 days during the period of June 21 to September 21, and they have a base saturation of less than 60 percent in all layers between depths of 10 and 30 inches. The Lithic Dystrochrepts are underlain by hard rock at depths of 10 to 20 inches.

Typic Dystrochrepts. The Blachly and Twindar soils are in this subgroup. The Typic Dystrochrepts are similar to the Lithic Dystrochrepts, except they are deeper than 20 inches. They occur at relatively high elevations and receive sufficient precipitation in the late spring and early summer so that they are not dry between depths of about 4 and 12 inches for periods as long as 45 days.

They are acid soils with a base saturation of less than 60 percent in all layers between depths of 10 and 30 inches.

Dystric Eutrochrepts. The Digger and Jason soils are in this subgroup. The Eutrochrepts are higher in exchangeable basis or not as strongly leached as the Dystrochrepts. Like the Dystrochrepts, they occur at relatively high elevations, and receive sufficient precipitation, so that they are not dry for as long as 45 days during the summer season between depths of 4 and 12 inches. The Dystric Eutrochrepts are integrading toward the Dystrochrepts, and have a base saturation that is 60 percent or more in some subhorizon between depths of 10 and 30 inches, but are free of calcium carbonate at all depths above 40 inches.

Dystric Xerochrepts. Soils of the Beekman, Jayar, Kanid, Renhaven, Ritner, Skymor, and Vena series are in this subgroup. Xerochrepts are drier in the summer than Dystrochrepts and Eutrochrepts. The soil moisture content is below the wilting point for more than 45 consecutive days during the period of June 21 to September 21 at depths of 4 to 12 inches. These soils occur either at lower elevations than the Dystrochrepts and Eutrochrepts, or in the southern part of the Roseburg District that has a relatively dry climate even at high elevations. The Dystric Xerochrepts are relatively acid and have a base saturation of less than 60 percent throughout the profile between depths of 10 and 30 inches.

Dystric Lithic Xerochrepts. The Shippa series is the only one in this subgroup. Shippa soils are similar to the Vena soils except they are less than 20 inches deep to hard volcanic rock. These soils have light colored surface horizons, weakly developed, very cobbly subsoils, base saturation, or less than 60 percent in all layers above bedrock, and are dry for at least 45 consecutive days during the summer season.

Lithic Xerochrepts. Soils of the Larmine, Pearsoll, and Vermisa series are in this subgroup. Lithic Xerochrepts differ from Dystric Lithic Dystrochrepts by being less leached, and do have a base saturation of 60 percent or more in some part of the soil between 10 inches and their contact with hard rock which occurs at 20 inches or less.

Typic Xerochrepts. Soils of the Atring, Barron, Chamate, and Siskiyou series are in this subgroup. They are all deeper than 20 inches to hard rock; have light colored surface horizons, weakly developed subsoil horizons, and have base saturations of 60 percent or more in some part of the soil between depths of 10 and 30 inches. They are all dry between depths of about 4 and 12 inches for at least 45 consecutive days in the period of June 21 and September 21.

Lithic Haplumbrepts. The Kilchis soils belong to the only series in this subgroup. The Umbrepts are richer in organic matter than the Ochrepts, and therefore have a dark colored (umbric) surface

horizon that is at least 10 inches thick. The Haplumbrepts are in the udic moisture regime which means the soil is not drier than the wilting point for as long as 45 consecutive days during the summer season; and they are also in the mesic temperature regime, which means that their mean annual soil temperature is warmer than 8^{o} C (47^{o} F). Base saturation of the surface layer is generally less than 50 percent, and the subsoil (cambic) horizon must have a base saturation of less than 50 percent, if the base saturation of the surface layer is more than 50 percent. Lithic Haplumbrepts are less than 20 inches deep to hard bedrock.

Typic Haplumbrepts. The soils of the Harrington, Klickitat and Preacher series are in this subgroup. Typic Haplumbrepts differ from Lithic Haplumbrepts by being deeper than 20 inches to hard bedrock. They have acid, dark colored surface horizons between 10 and 20 inches thick. There is no significant enrichment of clay in the weakly developed subsoil. They are in the udic, or relatively humid, moisture regime at higher elevations. They are in the mesic temperature regime. Many are on the gentler slopes in the mountainous regions. They are among the more productive soils in the District, provided they are not excessively gravelly or cobbly.

Subgroups of Mollisols

Lithic Ultic Haploxerolls. Soils of the Witzel series are the only ones classified in this subgroup. The Mollisols all have a mollic surface horizon, which is dark relatively thick, relatively high in organic matter, and rich in bases (above 50 percent base saturation). The dominant vegetation usually consists of grasses. The climate is usually too dry to support coniferous forest. The Xerolls are dry between depths of about 4 to 12 inches for at least 45 consecutive days during the period of June 21 and September 21. The Haploxerolls generally have a weakly developed (cambic) horizon below the mollic surface horizon, and do not have cemented pans or layers in the subsoil. The Lithic Haploxerolls are less than 20 inches deep to hard bedrock, and the Ultic Haploxerolls are somewhat leached, so that the base saturation is less than 75 percent in at least some part of the portion above hard bedrock.

Pachic Ultic Argixerolls. Soils of the Darby series are the only ones classified in this subgroup. The Argixerolls have a subsoil horizon enriched in clay by illuviation (argillic horizon) that occurs below, or overlapping with the mollic surface horizon that is dark colored, at least 10 inches thick and rich in both organic matter and bases. The Pachic Argixerolls have a mollic horizon that is very thick, or more than 20 inches thick. The Ultic Argixerolls, like the Ultic Haploxerolls, have a base saturation of less than 75 percent in at least some part of the upper 30 inches of the soil profile.

Subgroups of Utisols

Typic Haplohumults. Soils of the Apt, Honeygrove, Peavine and Shivigny series are in this subgroup. The Ultisols are old, strongly developed, highly leached soils that have subsoil horizons enriched in clay (argillic horizons) with only a small supply of bases. They differ from the Alfisols by having a base saturation of less than 35 percent at 50 inches from the upper boundary of the argillic horizon, or immediately above the bedrock if that is less than 50 inches from the top of the argillic horizon. The Humults are relatively high in organic matter, even in the subsoil. They have at least 1.5 percent organic matter in the upper six inches of the argillic horizon. The Haplohumults have a relatively thin argillic horizon, and significant amounts of weatherable minerals present in the argillic horizon. The Typic Haplohumults are in the udic moisture regime, and are not dry at depths of about 4 to 12 inches for as long as 45 consecutive days during the summer season. They occur in the more humid parts of the higher mountainous parts of the Roseburg District on old stable landscape positions.

Xeric Haplohumults. Soils of the Bellpine, Jory, and Nekia series are classified in this subgroup. These soils all have strongly acid, highly leached argillic horizons that are relatively high in organic matter in the upper part similar to the Typic Haplohumults. However they occur at lower elevations, that are drier than the Typic Haplohumults, and the soil moisture content at depths of about 4 to 12 inches is below the wilting point for at least 45 consecutive days during the period of June 21 to September 21. Thus, they are classified as Xeric Haplohumults.

Typic Haploxerults. The soils of the McGinnis, Tishar and Pollard series are classified in this subgroup. The Xerults have a xeric moisture regime, as is the case for the Xeric Haplohumults, but in addition are lower in organic matter. The Xerults commonly have a light colored surface horizon (ochric horizon), and the organic matter content of the upper six inches of the argillic horizon is less than 1.5 percent. The Xerults occur on old, stable landscapes in the Klamath Mountains in the southern portions of the Roseburg District which are apparently drier and warmer than the northern portions of the District. The Haploxerults have appreciable amounts of weatherable minerals in the argillic horizon and are not exceptionally thick. The Typic Haploxerults are deeper than 20 inches to bedrock and are well drained.

C. Detailed Soil Series Descriptions

This section contains a detailed description of each soil series in the Roseburg District listed in the order of the numerical symbols used on the soil map. The descriptions are given according to the format used in offical soil series descriptions.

Established Series
SRW-TSG
9/75

BLACHLY SERIES (10)

Soil Family: Fine, mixed, mesic Typic Dystrochrepts.

Typifying Pedon: Blachly silt loam - forested. (Colors are for moist soil unless otherwise noted.)

O2--½-0 inches; Dark, decomposed organic material.

A1--0-7 inches; Dark yellowish brown (10 YR 3/4) heavy silt loam light yellowish brown (10 YR 6/4) dry; moderate fine granular structure; loose, friable, slightly sticky, slightly plastic; many very fine and fine roots, many fine and medium irregular pores; 15 percent fine gravel; medium acid (pH 6.0); gradual smooth boundary. (5 to 10 inches thick).

A3--7-14 inches; Dark brown (7.5 YR 4/4) clay loam, light yellowish brown (10 YR 6/4) dry; strong fine granular structure; soft, friable, sticky, plastic; many very fine and fine roots; many fine and medium irregular pores; 10 percent fine gravel; medium acid (pH 5.8); abrupt smooth boundary. (5 to 10 inches thick).

B1--14-26 inches; Dark brown (7.5 YR 4/4) gravelly clay loam, reddish brown (5 YR 4/4) dry; moderate fine and medium subgranular blocky structure; firm, friable, sticky, plastic; common fine and few medium and coarse roots; few fine tubular pores; 15 percent fine gravel and 15 percent gravel; medium acid (pH 5.6); gradual smooth boundary. (10 to 16 inches thick).

B21--26-36 inches; Dark brown (7.5 YR 4/4) gravelly clay, reddish brown (5 YR 4/4) dry, moderate medium subangular blocky structure; firm, friable, very sticky, very plastic; common fine and few medium subangular blocky structure; firm, friable, very sticky, very plastic; common fine and few medium and coarse roots; few fine tubular pores; 15 percent fine gravel and 15 percent gravel; medium acid (pH 5.6); gradual wavy boundary. (8 to 16 inches thick).

B22--36-47 inches; Dark brown (7.5 YR 4/4) gravelly clay, reddish brown (5 YR 4/4) dry; moderate fine and medium subangular blocky structure; slightly hard firm, sticky, plastic; few fine roots; few fine tubular pores; 10 percent fine gravel and 10 percent gravel; strongly acid (pH 5.4); gradual wavy boundary. (8 to 15 inches thick).

B3--47-55 inches plus; Dark brown (7.5 YR 4/4) gravelly clay, reddish brown (5 YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, sticky, plastic; few fine roots; few fine tubular pores; 10 percent fine gravel; strongly acid (pH 5.4).

Type Location: Douglas County, Oregon. The site is located on the 24.0 road near the ridge top in the NE/NW Sec. 24, T. 24 S., R. 2W.

Established Series
SWR-TSG
7/74

JORY SERIES (12)

Soil Family: Clayey, mixed, mesic Xeric Haplohumults.

Typical Pedon: Jory silty clay loam, forested. (Colors for moist soil unless otherwise noted.)

A1--0 to 10 inches; dark reddish brown (5 YR 3/3) silty clay loam, light brown (7.5 YR 6/4) dry; moderate fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine medium roots; few fine pores; medium acid (pH 6.0); clear smooth boundary. (6 to 12 inches thick).

A3--10 to 18 inches; dark reddish brown (5 YR 3/4) silty clay loam, reddish brown (5 YR 5/4) dry; strong medium granular structure; slightly hard, friable, sticky, plastic; common fine and many medium roots; many fine pores; medium acid (pH 5.8); abrupt wavy boundary. (6 to 12 inches thick).

B21t--18 to 27 inches; yellowish red (5 YR 4/6) clay, reddish brown (5 YR 5/4) dry; moderate medium subangular blocky structure; hard, firm, sticky, plastic; common fine roots along ped faces; few fine pores; common thin patchy red clay films; strongly acid (pH 5.4); abrupt smooth boundary. (6 to 15 inches thick).

B22t--27 to 40 inches; dark red (2.5 YR 3/6) gravelly clay, yellowish red (5 YR 5/6) dry; strong medium subangular and angular blocky structure; very hard, very firm, sticky, plastic; common fine roots along ped faces; very few fine pores; moderate thick continuous red clay films; 30 percent highly weathered sandstone pebbles; medium acid (pH 5.8); clear wavy boundary. (10 to 20 inches thick).

B23t--40 to 50 inches; yellowish red (5 YR 4/6) very gravelly clay, yellowish red (5 YR 5/6) dry; strong medium subangular and angular blocky structure; very hard, very firm, sticky plastic; common fine roots along ped faces; very few fine pores; moderate thick continuous red clay films; 50 percent highly weathered sandstone pebbles; medium acid (pH 5.6); clear wavy boundary. (8 to 16 inches thick).

B3t--50 to 61 inches plus; yellowish red (5 YR 4/6) gravelly silty clay, yellowish red (5 YR 4/6) dry; weak course subangular blocky structure; very hard, firm, slightly sticky, plastic; few fine roots; very few pores; thick patchy red clay films, 20 percent highly weathered sandstone pebbles with moderately thick red clay films; medium acid (pH 5.6); clear wavy boundary.

Type Location: Douglas County, Oregon. The site is located on the 24-7-18.0 road 120 feet North of its junction with 24-7-17.2 road in the NE¼, section 18, T. 24 S., R. 7W.

Established Series
SRW-TSG
7/74

BELLPINE SERIES (13)

Soil Family: Clayey, mixed, mesic Xeric Haplohumults.

Typical Pedon: Bellpine clay loam - forested. (Colors for moist soil unless otherwise noted.)

A1--0 to 11 inches; dark reddish brown (5 YR 3/3) clay loam, reddish brown (5 YR 5/3) dry; moderate medium granular structure; slightly hard, firm, sticky, plastic; many very fine, fine, and medium roots; many very fine pores; medium acid (pH 5.8); clear smooth boundary. (6 to 12 inches thick).

B1t--11 to 19 inches, dark red (2.5 YR 3/6) clay, reddish brown (5 YR 5/4) dry; strong medium granular structure; slightly hard, firm, very sticky, very plastic; common fine and medium and few course roots; many fine and medium pores; few thin patchy red clay films; medium acid (pH 5.6); abrupt wavy boundary. (6 to 12 inches thick).

B21t--19 to 29 inches, dark red (2.5 YR 3/6) clay, yellowish red (5 YR 5/6) dry; strong medium subangular and angular blocky structure; extremely hard, very firm, very sticky, very plastic; common fine roots along ped faces; few fine pores; moderately thick continuous red clay films; 5 percent stones; strongly acid (pH 5.4); clear wavy boundary. (6 to 12 inches thick).

B22t--29 to 37 inches; dark red (2.5 YR 3/6) clay, yellowish red (5 YR 5/6) dry; moderate medium and coarse subangular and angular blocky structure; very hard, very firm, very sticky, very plastic; common fine roots along ped faces and few fine roots penetrating peds; common fine pores; moderately thick continuous red clay films; 10 percent stones; strongly acid (pH 5.4); clear irregular boundary. (5 to 12 inches thick).

C--37 inches; sandstone saprolite, yellow (10 YR 8/6) dry, many thick continuous red (2.5 YR 4/6) clay films along fracture lines.

Type Location: Douglas County, Oregon. The site is located 200 feet North of the intersection of 24-7-18 and 24-7-17.2 roads in the NE¼ NE¼, Sec. 18, T. 24 S., R. 7W.

Established Series
SRW
7/8/74

HONEYGROVE SERIES (14)

Soil Family: Clayey, mixed, mesic Typic Haplohumults.

Typical Pedon: Honeygrove very gravelly silty clay loam - forested. (Colors are for mosit soil unless otherwise noted.)

O1--½ to 0 inches; litter of salal leaves, Douglas-fir needles and cones.

A1--0 to 8 inches; dark reddish brown (5 YR 3/2) very gravelly silty clay loam, brown (10 YR 5/3) dry; weak very fine granular structure; soft, very friable, slightly sticky, slightly plastic; common fine roots; many fine and medium pores; 40 percent large iron and manganese concretions; slightly acid (pH 6.4); abrupt smooth boundary. (6 to 12 inches thick).

A3--8 to 25 inches; dark reddish brown (5 YR 3/4) gravelly silty clay loam; moderately fine and very fine granular structure; soft, friable slightly sticky, non-plastic; many very fine and medium and coarse roots; many fine and medium pores; 15 percent large iron and manganese concretions; medium acid (pH 6.0); abrupt smooth boundary. (10 to 20 inches thick).

B21t--25 to 39 inches; reddish brown (5 YR 4/4) clay; strong medium subangular blocky structure; slightly hard, friable, sticky, plastic; common very fine roots; few fine pores; few thin clay films on ped surfaces; medium acid (pH 5.8); clear smooth boundary. (10 to 20 inches thick).

B22t--39 to 51 inches; dark reddish brown (2.5 YR 3/4) clay; strong coarse and medium subangular blocky structure; firm, sticky, plastic; few fine roots; few fine pores; thin continuous clay films on ped surfaces; medium acid (pH 5.8); gradual wavy boundary. (10 to 16 inches thick).

B23t--51 to 79 inches; dark reddish brown (2.5 YR 3/4) clay; strong coarse angular and subangular blocky structure; firm, sticky, plastic; very few fine roots; very few fine pores; thin continuous clay films on ped surfaces; medium acid (pH 5.8); gradual irregular boundary. (15 to 30 inches thick).

B3t--79 to 97 inches plus; dark red (2.5 YR 3/6) heavy silt loam; moderate coarse angular blocky structure; very firm, slightly sticky, slightly plastic; very few fine roots; very few fine pores; moderately thick patchy clay films on ped surfaces; medium acid 9pH 5.6).

Type Location: Douglas County, Oregon. The site is on gently rolling broad ridge top along 21-6-13.0 road approximatly ½ mile from intersection with 21-5-18.0 road in the SW¼ NE¼, Sec. 23, T. 21 S., R. 6 W.

Established Series
SRW-TSG
9/75

CRUISER SERIES (19)

Soil Family: Fine - loamy, mixed, frigid Andic Cryochrepts.

Typical Pedon: Cruiser gravelly silt loam - forested. (Colors are for moist soil unless otherwise noted).

A1--0 to 8 inches; dark brown (10 YR 3/3) gravelly heavy silt loam, brown (10 YR 5/3) dry; moderate medium granular structure; soft, friable, slightly sticky, slightly plastic; many fine and medium roots; many fine interstitial pores; 15 percent fine gravel; strongly acid (pH 5.2); abrupt smooth boundary. (6 to 12 inches thick).

A3--8 to 20 inches; reddish brown (5 YR 4/4) clay loam, reddish brown (5 YR 5/3) dry; weak medium subangular blocky breaking to moderate medium granular structure; soft, friable, sticky, plastic; common fine and medium roots; many very fine interstitial pores; 10 percent coarse gravel; medium acid (pH 5.6); clear wavy boundary. (8 to 15 inches thick).

B1--20 to 27 inches; reddish brown (5 YR 4/4) clay loam, light reddish brown (5 YR 6/3) dry; weak medium subangular blocky structure; slightly hard; friable sticky, plastic; common fine and medium roots, common fine pores; 10 percent coarse gravel, medium acid (pH 5.8); clear wavy boundary. (5 to 10 inches thick).

B2--27 to 41 inches; reddish brown (5 YR 4/4) clay loam, light reddish brown (5 YR 6/3) dry; moderate coarse and medium subangular blocky structure; slightly hard, friable, sticky, plastic; common medium roots; common fine pores; 10 percent coarse gravel; medium acid (pH 5.8); diffuse wavy boundary. (10 to 20 inches thick).

B3--41 to 48 inches plus; yellowish red (5 YR 4/6) gravelly clay loam, light reddish brown (5 YR 6/4) dry; moderate coarse subangular blocky structure; slightly hard, friable, sticky, plastic; few fine roots; few fine pores; 25 percent coarse gravel; medium acid (pH 5.8).

Type Location: Douglas County, Oregon. The site is located on the 29.1 road just past Mellow Moon Springs in the SE¼ NE¼ NE¼, Sec. 28, T. 24 S., R. 1W.

Established Series
SWR
7/8/74

PEAVINE SERIES (20)

Soil Family: Clayey, mixed, mesic Typic Haplohumults.

Typical Pedon: Peavine clay loam - forested. (Colors are for moist soil unless otherwise noted.)

O1--½ to 0 inches; Douglas-fir needles and cones, and black salal leaves.

A1--0 to 11 inches; brown (7.5 YR 5/4) light clay loam, light gray (10 YR 7/1) dry; moderate fine subangular blocky structure; soft, friable, slightly sticky, slightly plastic; many very fine and fine and common coarse roots; many fine and medium pores; slightly acid (pH 6.2); clear smooth boundary. (6 to 12 inches thick).

B21t--11 to 20 inches; strong brown (7.5 YR 5/6) clay, light brown (7.5 YR 6/4) dry; moderate medium subangular blocky structure; slightly hard, friable, sticky, plastic; common fine roots; many fine pores; common moderately thick red clay films; slightly acid (pH 6.2); clear wavy boundary. (6 to 12 inches thick).

B22t--20 to 36 inches; strong brown (7.5 YR 5/6) gravelly clay, reddish yellow (7.5 YR 7/6) dry; strong medium subangular blocky structure; hard, firm, sticky, plastic; few fine roots; common fine and few medium pores; many moderately thick red clay films; 20 percent highly decomposed sandstone pebbles; slightly acid (pH 6.4); clear wavy boundary. (10 to 20 inches thick).

C--37 inches plus; deeply weathered sandstone; reddish yellow (7.5 YR 6/8) dry; red clay films along fracture lines.

Pedon Location: Douglas County, Oregon. The site is on a ridge point along a switchback of old Paradise Truck Trail in the NE¼ SW¼, Sec. 12, T. 21 S., R. 7W.

Established Series
SRW-TSG
9/75

NEKIA SERIES (23)

Soil Family: Fine, mixed, mesic Xeric Haplohumult.

Typifying Pedon: Nekia silty clay loam -forested (Colors for moist soil unless otherwise noted).

A1--0-10 inches; Dark reddish brown (5 RY 3/3) silty clay loam, light brown (7.5 YR 6/4) dry; moderate fine and medium granular structure; soft, very friable, slightly sticky, slightly plastic; many very fine, fine and medium roots; few fine pores; medium acid (pH 6.0); clear smooth boundary. (6 to 12 inches thick).

A3--10-14 inches; Dark reddish brown (5 YR 3/4) silty clay loam, reddish brown (5 YR 5/4) dry; strong medium granular structure; slightly hard, friable, sticky, plastic; common fine and many medium roots; many fine pores; medium acid (pH 5.8); abrupt wavy boundary. (3 to 8 inches thick).

B21t--14-21 inches; Yellowish red (5 YR 4/6) clay, reddish brown (5 YR 5/4) dry; moderate medium subangular blocky structure; hard, firm, sticky, plastic; common fine roots along ped faces; few fine pores; common thin patchy red clay films; strongly acid (pH 5.4); abrupt smooth boundary. (5 to 10 inches thick).

B22t--21-28 inches; Dark red (2.5 YR 3/6) gravelly clay, yellowish red (5 YR 5/6) dry; strong medium subangular and angular blocky structure; very hard, very firm, sticky, plastic; common fine roots along ped faces; very few fine pores; moderate thick continuous red clay films; 30 percent highly weathered basalt pebbles; medium acid (pH 5.8); clear wavy boundary. (6 to 15 inches thick).

B3t--28-35 inches; Yellowish red (5 YR 4/6) gravelly silty clay, yellowish red (5 YR 4/6) dry; weak coarse subangular blocky structure; very hard, firm, slightly sticky, plastic; few fine roots; very few pores; thick patchy red clay films, 20 percent highly weathered basalt pebbles with moderately thick red clay films; medium acid (pH 5.6); clear wavy boundary. (0 to 10 inches thick).

C--35 inches plus; Soft, basalt saprolite, few hard basalt pebbles, moderately thick clay skins in cracks and on pebbles.

Type Location: Douglas County, Oregon. The site is located along the 20.0 road in the NE/NE Sec. 15, T. 22 S., R. 4 W.

Established Series
SRW-TSG
6/75

RITNER SERIES (24)

Soil Family: Clayey - skeletal, mixed, mesic Dystric Xerochrepts.

Typical Pedon: Ritner very gravelly clay loam - forested. (Colors are for moist soils unless otherwise noted).

A1-0 to 12 inches; dark brown (7.5 YR 3/2) very gravelly clay loam, dark yellowish brown (10 YR 4/4) dry; strong fine granular structure; loose, very friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; many very fine pores; 50 percent coarse gravel; neutral (pH 6.6); clear wavy boundary. (6 to 15 inches thick).

B2--12 to 23 inches; dark brown (7.5 YR 4/4) very gravelly clay, dark yellowish brown (10 YR 4/4) dry; strong medium subangular blocky structure; very friable, friable, sticky, plastic; many fine and medium roots; common very fine tubular pores; 50 percent coarse gravel; neutral (pH 6.8); gradual irregular boundary. (6 to 15 inches thick).

B3--23 to 25 inches; dark brown (7.5 YR 4/4) very gravelly clay, dark yellowish brown (10 YR 4/4) dry; weak medium subangular blocky structure; slightly hard, firm, sticky, plastic; common fine and very fine roots; few very fine tubular pores; 70 percent coarse gravel; neutral (pH 6.8); gradual irregular boundary. (0 to 6 inches thick).

R--35 inches; slightly fractured basalt.

Type Location: Douglas County, Oregon. The site is located on the 25-4-13.0 road, approximately 3/4 mile South of the junction of the 25-4-14.0 roads in the SW¼ NE¼, Sec. 23, T. 25 S., R. 4 W.

Tentative Series
SRW-TSG-AON
11/75

HARRINGTON SERIES (29)

The Harrington series consists of moderatly deep, well drained soils that formed from colluvium weathered from basalt and andesite bedrock. Harrington soils have steep and very steep mountainous terrain and have slopes of 25 to 85 percent. The annual precipitation is about 90 inches and the mean annual air temperature is about 49° F.

Taxonomic Class: Loamy-skeletal, mixed, mesic Typic Haplumbrepts

Typical Pedon: Harrington very gravelly loam, forested. (Colors are for mosit soil unless otherwise noted).

O1--1 inch to 0; organic litter of Douglas-fir needles, twigs, leaves, and mosses.

A1--0 to 5 inches; dark reddish brown (5 YR 3/2) gravelly loam, reddish brown (5 YR 4/3) dry; moderate medium and fine granular structure; friable, nonsticky and nonplastic; many roots; many very fine irregular pores; 35 percent fine pebbles, medium acid (pH 5.6); clear wavy boundary. (4 to 10 inches).

B21--5 to 12 inches, dark reddish brown (5 YR 3/3) very gravelly light clay loam, reddish brown (5 YR 4/4) dry; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; common roots; common very fine irregular pores; 50 percent coarse pebbles; strongly acid (pH 5.2); clear wavy boundary. (12 to 18 inches).

B3--28 to 34 inches; reddish brown (5 YR 4/4) very gravelly loam (5 YR 5/6) dry; weak medium and fine subangular blocky structure; friable, slightly sticky and slightly plastic; few roots; common fine and medium pores; 50 percent coarse pebbles; 20 percent cobbles; strongly acid (pH 5.2); abrupt wavy boundary. (5 to 10 inches).

R--34 inches; fractured basalt of the Little Butte Formation.

Type Location: Douglas County, Oregon. The site is located on the 9.0 road, 400 yards Northwest of junction with 16.1 road in the NE¼ SW¼, Sec. 9, T. 25 S., R. 2 W.

Range in Characteristics: The mean annual soil temperature ranges from 47° to 55° F. Depth to bedrock is 20 to 40 inches. The amount of rock fragments ranges from 35 to 80 percent in the B horizon.

The A horizon has hue of 7.5 YR or 5 YR, value of 2 or 3 moist, 4 or 5 day, and chroma of 2 to 3 moist, 3 or 4 day. The texture is clay loam or loam with 35 to 60 percent pebbles.

The B horizon has hue of 5 YR, value of 3 or 4 moist and 4 to 6 dry and chroma of 3 trough 6 moist and dry. The texture ranges from very gravelly clay loam to very gravelly loam with 50 to 75 percent pebbles and cobbles and more than 18 percent clay.

R horizon can be dark colored basalt, breccias, and tuffs.

Competing Series: These are the Brightwood, Klickitat, Solleks, and Zenker series. Brightwood soils have B horizons with less than 18 percent clay, strongly acid reaction, and hue yellower than 5 YR in the B horizon. Klickitat, Solleks and Zenker soils are deeper than 40 inches to bedrock. Solleks and Zenker soils have hue yellower than 5 YR in the B horizon.

Geographic Setting: Harrington soils are on ridges, steep and very steep sideslopes, ridge noses, and headwalls in mountainous

areas. Slope gradients range from 25 to 90 percent. Elevation ranges from 500 to 3200 feet. The soils formed in colluvium weathered from basalt and breccias. The climate is cool moist winters and warm dry summers. Precipitation ranges from 60 to 90 inches. Mean January temperature is 37° F.; the mean July temperature is 63° F; the average annual temperature is 45° to 53° F. The frost-free season is about 160 to 200 days.

Geographically Associated Soils: These are the Blachly, Honeygrove, Shivigny, Kilchis, and Zango soils. Blachly, Honeygrove, and Shivigny soils are deep, fine textured and are nonskeletal. Kilchis and Zango soils are less than 20 inches deep to a lithic contact.

Drainage and Permeability: Well drained, rapid to very rapid runoff; moderately rapid permeability.

Use and Vegetation: Timber production, wildlife, and watershed. Native vegetation is Douglas-fir, hemlock, western red cedar, salal, vine maple, red huckleberry, and swordfern.

Distribution and Extent: Western slopes of the Cascade Mountains in Oregon. The series is of moderate extent.

Series Proposed: Douglas County, Oregon, 1975. The name is taken from Harrington Creek which is North of Idleyld Park, Oregon.

Remarks: Harrington soils are labeled Unit 29 in the BLM soil survey.

Established Series
SRW-TSG
9/75

KILCHIS SERIES (35)

Soil Family: Loamy - skeletal, mixed, mesic Lithic Haplumbrepts.

Typical Pedon: Kilchis very gravelly loam - forested. (Colors are for moist soil unless otherwise noted.)

02--2-0 inches; dark organic material and gravel and cobbles.

A--0 to 4 inches; dark brown (7.5 YR 4/4) very gravelly loam, pale brown (10 YR 6/3) dry; moderate fine granular structure; soft, friable, nonsticky, nonplastic; many fine and medium roots; many fine irregular pores; 40 percent fine gravel and gravel; very strongly acid (pH 5.0); clear wavy boundary. (3 to 8 inches thick).

B--4 to 17 inches; strong brown (7.5 YR 5/6) very gravelly silt loam, reddish yellow (7.5 YR 6/6) dry; strong fine granular structure; firm, friable, slightly sticky, slightly plastic;

many fine, medium and coarse roots; many fine irregular pores; 40 percent fine gravel and 40 percent coarse gravel and cobbles; very strongly acid (pH 5.0); gradual wavy boundary. (6 to 16 inches thick).

R--17 inches; slightly fractured basalt.

Type location: Douglas County, Oregon. The site is located in an old rock pit 3/4 mile up the 24.0 road in the NW/SE sec. 24, T. 24 S., R. 2 W.

Established Series
SRW-TSG
6/75

WITZEL SERIES (36)

Soil Family: Loamy - skeletal, mixed, mesic Lithic Ultic Haploxerolls.

Typical Pedon: Witzel very gravelly clay loam - forested. (Colors are for moist soil unless otherwise noted.)

A--0 to 3 inches; very dark grayish brown (10 YR 3/2) very gravelly clay loam, brown (10 YR 4/3) dry; strong fine subangular blocky structure; loose, friable, slightly sticky, slightly plastic; many very fine and fine roots; many fine irregular pores; 50 percent coarse gravel and cobbles; neutral (pH 6.8); clear smooth boundary. (3 to 8 inches thick).

B2--3 to 17 inches; dark yellowish brown (10 YR 3/4) very gravelly clay loam, brown (10 YR 4/3) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic, many very fine and fine roots; common fine tubular pores; 70 percent coarse gravel and cobbles; neutral (pH 6.8); gradual irregular boundary. (5 to 16 inches thick).

R--17 inches; slightly fractured basalt.

Type Location: Douglas County, Oregon. The site is located at the junction of the 25-4-26.1 and 25-4-13.0 roads in SE¼ NE¼ Se. 27, T. 25 S., R. 4 W.

Established Series
SRW
6/25/74

APT SERIES (50)

Soil Family: Clayey, mixed, mesic Typic Haplohumults.

Typical Pedon: Apt silt loam - forested. (Colors are for moist soil unless otherwise noted.)

A1--0 to 8 inches; dark brown (10 YR 3/3) silt loam, grayish brown (10 YR 5/2) dry; moderate fine granular structure; soft, very friable, slightly sticky, nonplastic; many fine and very fine roots; many fine and very fine pores; medium acid (pH 5.6); abrupt smooth boundary. (6 to 12 inches thick).

A3--8 to 14 inches; dark yellowish brown (10 YR 4/4) silt loam, pale brown (10 YR 6/3) dry; moderate medium granular structure; hard, friable, slightly sticky, slightly plastic; many fine and very fine roots; many fine and very fine pores; medium acid (pH 6.0); abrupt smooth boundary. (4 to 12 inches thick).

B1t--14 to 20 inches; dark yellowish brown (10 YR 4/4) clay loam, light yellowish brown (10 YR 6/4) dry; moderate medium and coarse subangular blocky structure; hard, firm, slightly sticky, plastic; few fine roots; few fine and common very fine pores; few thin clay films on ped faces; medium acid (pH 5.6); clear wavy boundary. (5 to 12 inches thick).

B21t--20 to 26 inches; dark yellowish brown (10 YR 4/4) heavy silty clay loam, light yellowish brown (10 YR 6/4) dry; moderate medium subangular blocky structure; very hard, firm, sticky, plastic; few fine roots; common fine and very fine and few medium pores; common thin clay films on ped faces; medium acid (pH 5.6); clear wavy boundary. (4 to 10 inches thick).

B22t--26-37 inches; dark brown (7.5 YR 4/4) light silty clay, light yellowish brown (10 YR 6/4) dry; moderate medium subangular blocky structure; very hard, firm, sticky, plastic; few fine roots; common fine and very fine and few medium pores; common thin clay films on ped faces; common medium distinct 10 YR 5/1 mottles; medium acid (pH 5.6); gradual wavy boundary. (8 to 18 inches thick).

B3t--37 to 49 inches; dark brown (7.5 YR 4/4) silty clay loam, brownish yellow (10 YR 6/6) dry; weak medium angular blocky structure; hard friable, sticky, slightly plastic; very few fine roots; common fine and very fine and few medium pores; common moderately thick clay films on ped faces; many coarse distinct 10 YR 5/3 mottles; medium acid (pH 5.6); gradual wavy boundary. (8 to 16 inches thick).

C--49 to 57 inches; strong brown (7.5 YR 5/6) clay loam, brownish yellow (10 YR 6/6) dry; massive structure; hard, friable, sticky, slightly plastic; very few fine roots; common fine and medium pores; 20 percent rounded sandstone pebbles; many coarse distinct 10 YR 5/3 mottles; medium acid (pH 5.8).

Type Location: Douglas County, Oregon. The site is along the South Fork Access Road about 250 yards East of intersection of 21-6-15.0 road on an old terrace 35 feet above present stream channel in the SW¼ SE¼, Sec. 15, T. 21 S., R. 6W.

Tentative Series
SWR-TSG-AON
12/75

TWINDAR SERIES (53)

The Twindar series consists of moderately deep, well drained soils that formed in colluvium weathered from tuffs, breccias, and andesites. Twindar soils are on steep to very steep slopes in mountainous areas and have slopes of 50 to 90 percent. The annual precipitation is about 75 inches and annual air temperature is about 49° F.

Taxonomic Class: Loamy-skeletal, mixed, mesic Typic Dystrochrepts.

Typical Pedon: Twindar very gravelly loam, forested. (Colors are for moist soil unless otherwise noted.)

O1--1 inch to 0; rhododendron and salal leaves, twigs, fir needles, and coarse pebbles.

A1--0 to 9 inches; dark brown (10 YR 3/3) very gravelly loam, pale brown (10 YR 6/3) dry; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine to coarse roots; many very fine irregular pores; 50 percent pebbles; 5 percent cobbles; medium acid (pH 6.0); clear wavy boundary. (4 to 10 inches thick).

B2--9 to 25 inches; yellowish brown (10 YR 5/4) very gravelly light clay loam, very pale brown (10 YR 7/3) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine to medium tubular pores; 65 percent pebbles; medium acid (pH 6.0); clear wavy boundary. (15 to 30 inches thick).

R--25 inches; hard, slightly fractured andesite.

Type Location: Douglas County, Oregon. The site is located on the 24.0 road about 1/2 mile from the 13.0 road in the NW¼ SE¼, Section 13, T. 24 S., R. 2 W.

Range in Characteristics: The mean annual soil temperature is 47° to 55° F. The soils have a udic moisture regime but have a short dry period of less than 45 consecutive days during the summer months. The solum thickness and depth to bedrock range from 20 to 40 inches with rock fragments ranging from 50 to 80 percent.

The A horizon has value of 3 or 4 moist, 6 or 7 dry, and chroma of 3 or 4 moist or dry. The texture ranges from very gravelly loam to very gravelly silt loam.

The B horizon has value of 4 or 5 moist, 6 or 7 dry and chroma of 3 through 5 moist, 3 or 4 dry. It is clay loam or loam with 60 to 85 percent rock fragments and 18 to 30 percent clay.

The R horizon is usually hard slightly fractured light colored andesite, tuffs, or breccias.

Competing Series: These are the Crescent, Cupola, Deserter, Itswoot, Klone, and Zango series. Crescent soils are deeper than 40 inches to bedrock. Cupola soils are deeper than 40 inches to bedrock, have weakly cemented C horizons, and have less than 18 percent clay. Deserter soils have hue redder than 7.5 YR and are deeper than 40 inches to bedrock. Itswoot soils are deeper than 40 inches to bedrock. Klone soils have formed in glacial till and outwash and are deeper than 40 inches to bedrock. Zango soils are 12 to 20 inches deep to bedrock.

Geographic Setting: Twindar soils are on ridges, steep or very steep smooth or dissected slopes in mountainous areas at elevations of 500 to 3200 feet. The soils formed in colluvium weathered from light colored andesite, tuffs, and breccias. The climate is characterized by cool moist winters and warm dry summers with precipitation ranging from 60 to 90 inches. Mean January temperature is 37^{o} F.; mean July temperature is 63^{o} F.; and mean annual temperature is 45^{o} F. to 53^{o} F. Average frost-free period is 120 to 200 days.

Geographically Associated Soils: These are the Blachly, Harrington, Honeygrove, Kilchis, Klickitat and Shivigny series, and the competing Zango soils. Blachly Honeygrove and Shivigny soils are fine-textured and are nonskeletal. Klickitat soils have umbric epipedons and are deep. Harrington soils have umbric epipedons and are 20 to 40 inches deep to basalt bedrock.

Drainage and Permeability: Well drained, rapid and very rapid runoff; moderately rapid permeability.

Use and Vegetation: Timber production, wildlife, and watershed. Native vegetation is Douglas-fir, hemlock, western red cedar, salal, vine maple, red huckleberry and swordfern.

Distribution and Extent: Western slopes of the Cascade Mountains, Oregon. The series is of moderate extent.

Series Proposed: Douglas County, Oregon, 1975. The name is coined from Twin Cedar Spring.

Remarks: Twindar soils are labeled Unit 53 in the BLM soil survey.

Established Series
Rev. SRW-TSG
7/74

PREACHER SERIES (57)

Soil Family: Fine-loamy, mixed, mesic Typic Haplumbrepts.

Typical Pedon: Preacher loam - forested. (Colors are for moist soil unless otherwise noted.)

A1--0 to 9 inches; dark grayish brown (10 YR 3/2) loam, very pale brown (10 YR 5/3) dry; moderate medium subangular blocky structure breaking to moderate fine granular structure: soft, friable, slightly sticky, nonplastic; common fine roots; common fine pores; slightly acid (pH 6.4); very abrupt smooth boundary. (6 to 12 inches thick).

B1--9 to 20 inches; dark yellowish brown (10 YR 3/3) heavy loam, pale brown (10 YR 5/3) dry; moderate medium subangular blocky structure breaking to moderate fine granular structure; soft, friable, slightly sticky, slightly plastic; few fine roots; many fine pores; medium acid (pH 5.6); abrupt smooth boundary. (6 to 16 inches thick).

B21--20 to 34 inches; yellowish brown (10 YR 5/4) heavy loam; strong medium subangular blocky structure; soft, firm, slightly sticky, slightly plastic; very few coarse roots; few fine pores; very few thin patchy clay films; 15 percent small sandstone pebbles; medium acid (pH 5.8); clear smooth boundary. (10 to 20 inches thick).

B22--34 to 57 inches; dark yellowish brown (10 YR 4/4) light clay loam; strong coarse and medium subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; very few medium roots; many fine and few medium pores; very few thin patchy clay films; 5 percent small sandstone pebbles; medium acid (pH 5.6); gradual wavy boundary. (15 to 30 inches thick).

C--57 inches plus; yellowish brown (10 YR 5/6) silt loam; massive; slightly hard, friable, slightly sticky, nonplastic; many fine and few medium pores; 10 percent sandstone pebbles; medium acid (pH 5.6).

Type Location: Douglas County, Oregon. Site is at a landing at the end of a short spur road off 21-6-16.2 road approximately 200 yards North of South Fork Access Road in the SW¼ NE¼, Sec. 16, T. 21 S., R. 6 W.

Tentative Series
SRW-TSG-AON
11/75

JASON SERIES (64)

The Jason series consists of shallow, somewhat excessively drained soils that formed in colluvium weathered from sandstone. Jason soils have steep and very steep mountainous terrain and have slopes of 25 to 85 percent. The annual precipitation is about 75 inches and annual air temperature is about 50° F.

Taxonomic Class: Loamy-skeletal, mixed, mesic, shallow Dystric Eutrochrept

Typical Pedon: Jason very gravelly loam, forested. (Colors are for moist soil unless otherwise noted.)

O1--1 to 0 inches; Douglas-fir needles and cones, bark, swordfern leaves.

A1--0 to 4 inches; dark grayish brown (10 YR 4/2) very gravelly loam, grayish brown (10 YR 5/2) dry; moderate fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; many very fine to medium irregular pores; 50 percent pebbles; slightly acid (pH 6.2); smooth clear boundary. (3 to 7 inches thick).

B2--4 to 16 inches; brown (10 YR 4/3) very gravelly silt loam, light yellowish brown (10 YR 6/4) dry; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many very fine, fine and few coarse roots; many very fine to medium tubular and irregular pores; 50 percent pebbles; slightly acid (pH 6.4); abrupt irregular boundary. (8 to 15 inches thick).

CR--16 inches; soft, highly fractured sandstone; fractures are 2 to 6 inches apart.

Type Location: Douglas County, Oregon. The site is located on the 27.3 road approximately 3/4 mile Southwest of its junction with the 26.4 road in the NW¼ NE¼, section 33, T. 24 S., R. 8 W.

Range in Characteristics: The average soil temperature is 50° to 54° F. The soils are usually moist and dry for less than 45 days during the 120 day period following the summer solstice. Solum thickness and depth to a paralithic contact range from 10 to 20 inches. The control section has from 50 to 80 percent rock fragments mostly pebble size and less than 18 percent clay.

The A horizon has value of 4 to 5 moist, 5 or 6 dry, and chroma of 20 or 3 moist and dry. The texture commonly is very gravelly loam but ranges to gravelly loam.

The B horizon has hue of 10 YR or 7.5 YR, value of 4 or 5 moist, 6 or 7 dry and chroma of 2 through 4 moist and 4 or 5 dry. The texture ranges from very gravelly loam to very gravelly silt loam.

The Cr horizon is highly variable in the spacing of the fractures, ranging from less than 4 inches apart to 12 inches or more in short distances.

Competing Series: These are the Digger, Hatchery and Trask series. All of these soils are deeper than 20 inches to paralithic or lithic contact. Also Hatchery soils have a lithic contact at depths of 20 to 40 inches. Trask soils have umbric epipedons less than 10 inches thick and have less than 60 percent base saturation throughout the control section.

Geographic Setting: Jason soils are on steep ridgetops, very steep headwalls, and very steep ridge noses in mountainous areas. Elevations range from 800 to 2800 feet. The soils formed in colluvium weathered from sandstone and siltstone. The climate is characterized by cool moist winters and warm dry summer periods with precipitation of 50 to 100 inches. Mean annual temperature is 51° F.; average January temperature is about 39° F.; and average July temperature is about 63° F. The average frost-free season is 160 190 days.

Geographically Associated Soils: Jason soils are associated with Apt, Bohannon, Honeygrove, Preacher and Umpcoos soils and the competing Digger and Trask soils. Apt and Honeygrove soils have fine textured argillic horizons. Bohannon soils have umbric epipedons, are fine-loamy, and 20 to 40 inches deep to bedrock. Preacher soils are fine-loamy and deep. Umpcoos soils are less than 20 inches deep to a lithic contact and have base saturation less than 60 percent.

Drainage and Permeability: Somewhat excessively drained; rapid and very rapid runoff; rapid permeability.

Use and Vegetation: Timber production, watershed, and wildlife. Natural vegetation is Douglas-fir, scattered bigleaf maple, salal, swordfern, vine maple, and oceanspray.

Distribution and Extent: Jason soils are in the Coast Range, Oregon. The series is of minor extent.

Series Proposed: Douglas County, Oregon, 1975. Name is coined.

Remarks: Jason soils are labeled Unit 64 in the BLM soil survey.

Established Series
SRW
7/8/74

DIGGER SERIES (66)

Soil Family: Loamy-skeletal, mixed, mesic Dystric Eutrochrepts.

Typical Pedon: Digger gravelly loam - forested. (Colors are for moist soil unless otherwise noted.)

O1--1 to 0 inches; partially decomposed litter from salal leaves and Douglas-fir needles.

A1--0 to 8 inches; dark brown (10 YR 3/4) gravelly loam, light brownish gray (10 YR 6/2) dry; weak very fine granular structure; loose, nonsticky; many fine and few medium roots; many fine and very fine pores; 25 percent gravel; slightly acid (pH 6.4); abrupt smooth boundary. (4 to 10 inches thick).

B1--8 to 18 inches; dark brown (10 YR 4/3) gravelly silt loam, pale brown (10 YR 6/3) dry; moderate medium subangular blocky structure; soft, friable, nonsticky, nonplastic; common fine pores; 30 percent gravel; slightly acid (pH 6.2); clear smooth boundary. (6 to 16 inches thick).

B2--18 to 34 inches; yellowish brown (10 YR 5/4) very gravelly heavy silt loam, very pale brown (10 YR 7/3) dry; moderate medium subangular blocky structure; soft, friable, slightly sticky, slightly plastic; few fine and medium roots; many very fine and common fine pores; 50 percent gravel; slightly acid (pH 6.2); clear wavy boundary. (10 to 20 inches thick).

B3--34 to 39 inches; yellowish brown (10 YR 5/6) very gravelly silt loam, very pale brown (10 YR 7/3) dry; weak medium subangular blocky structure; slightly hard, firm, nonsticky, nonplastic; few fine roots; common fine pores; medium acid (pH 6.0); clear wavy boundary. (0 to 10 inches thick).

C--39 to 58 inches; unconsolidated, highly fractured and weathered siltstone, (10 YR 6/3) dry, few sandstone cobbles.

Type Location: Douglas County, Oregon. The site is along a road cut on South Fork Access Road approximatly 250 yards South of sandstone rock quarry in the SE¼ NE¼, Sec. 13, T. 21 S., R. 6 W.

Tentative Series
SRW-TSG-AON
12/75

ZANGO SERIES (70)

The Zango series consists of shallow, excessively well drained soils that formed in colluvium weathered from light colored tuffs,

breccias, and adesite rocks. Zango soils are on very steep dissected slopes and very narrow ridgetops in mountainous areas and have slopes of 60 to 100 percent. The annual precipitation is about 75 inches and annual temperature is 49° F.

Taxonomic Class: Loamy-skeletal, mixed, mesic Lithic Dystrochrepts.

Typical Pedon: Zango very gravelly sandy loam, forested. (Colors are for moist soil unless otherwise noted.)

O1--1 inch to 0; salal leaves, stems of beargrass and bracken fern.

A1--0 to 10 inches; gray (10 YR 5/1) very gravelly sandy loam, white (10 YR 8/1) dry; weak fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine to medium roots; many very fine irregular pores; 40 percent pebbles; medium acid (pH 5.6); clear wavy boundary. (5 to 10 inches thick)

B2--10 to 17 inches; dark brown (7.5 YR 4/4) very gravelly loam, pink (7.5 YR 7/4) dry; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine to medium roots; common very fine and fine tubular pores; 45 percent pebbles; strongly acid (pH 5.4); abrupt wavy boundary. (6 to 12 inches thick).

R--17 inches; hard welded tuff.

Type Location: Douglas County, Oregon. The site is located on the 25.1 road 1 mile up from the 1.0 road in the SE¼ NW¼, section 30, T. 24 S., R. 1 W.

Range in Characteristics: The mean annual soil temperature ranges from 47°-55° F. The soils have a udic moisture regime but have a short dry period of less than 45 consecutive days during the summer months. The profile has a weighted average of rock fragments of 35 to 60 percent in the control section. The hue ranges from 10 YR to 7.5 YR.

The A horizon has value of 4 through 6 moist, 6 through 8 dry, and chroma of 1 or 2 moist or dry. The texture ranges from very gravelly loam to very gravelly sand loam.

The B horizon has value of 4 or 5 moist, 6 through 8 dry, and chroma of 4 or 5 moist or dry. The texture ranges from very gravelly clay loam to very gravelly loam with 18 to 30 percent clay.

The R horizon ranges from light colored tuffs, breccias, and andesites.

Competing Series: These are the Dimal, Harrington, Twindar, and Umpcoos series. Dimal soils are in a 140 to 180 inch precipitation zone and lack a dry summer period and are commonly flaggy or channery. Harrington soils have umbric epipedons and are 20 to 40 inches deep to bedrock. Umpcoos soils are moderately coarse textured with less than 18 percent clay in the B horizon.

Geographical Setting: The Zango soils are on very steep slopes, usually headwalls and dissected sideslopes in mountainous areas. Elevations range from 500 to 3200 feet. The soils formed in colluvium weathered from tuffs, breccias, and andesites. Winters are cool and moist and summers are warm and dry. Average annual precipitation is 60 to 90 inches. Average January temperature is 37^{o} F.; mean July temperature is 63^{o} F; and mean annual temperature is 45^{o} F. to 53^{o} F. The average frost-free period is 120 to 200 days.

Geographically Associated Soils: These are the Blachly, Holderman, Honeygrove, Kilchis, Klickitat, Shivigny, and Winberry series and the competing Harrington and Twindar soils. Blachly, Honeygrove, and Shivigny are fine-textured and are nonskeletal. Klickitat soils have umbric epipedons and are deep. Kilchis soils have umbric epipedons and hue redder than 7.5 YR in the B horizons.

Drainage and Permeability: Well drained, rapid and very rapid runoff; moderately rapid permeability.

Use and Vegetation: Timber production, wildlife, and watershed. Native vegetation is Douglas-fir, hemlock, western red cedar, salal, vine maple, red huckleberry, and swordfern.

Distribution and Extent: Western slopes of the Cascade Mountains in Oregon. The series is of moderate extent.

Series Proposed: Douglas County, Oregon, 1975. The name is coined.

Remarks: Zango soils are labeled Unit 70 in the BLM soil survey.

Tentative Series
SRW-TSG-AON
12/75

SHIVIGNY SERIES (300)

The Shivigny series consists of deep, well drained soils that formed from colluvium and slopewash weathered from tuffs, breccias, and andesite. Shivigny soils are on gently sloping to steep benches and sideslopes and have slope gradients of 5 to 35 percent. The mean annual precipitation is about 60 inches and mean air temperature is about 50^{o} F.

Taxonomic Class: Clayey-skeletal, mixed, mesic Typic Haplohumults.

Typical Pedon: Shivigny very gravelly loam, forested. (Colors are for moist soil unless otherwise noted.)

A1--1 to 5 inches; dark reddish brown (5 YR 3/4) very gravelly heavy loam, reddish brown (5 YR 5/4) dry; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; 55 percent pebbles and 5 percent cobbles; neutral (pH 6.8); clear wavy boundary. (4 to 7 inches thick).

A3--5 to 10 inches; dark reddish brown (5 YR 3/4) gravelly heavy loam, light reddish brown (5 YR 6/4) dry; strong medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine to medium roots; many very fine tubular pores; 35 percent pebbles; neutral (pH 6.8); clear irregular boundary. (4 to 8 inches thick).

B1--10 to 21 inches; yellowish red (5 YR 4/6) very stony clay loam, reddish yellow (5 YR 6/6) dry; moderate medium subangular blocky structure with pockets of strong medium granular structure; hard, friable, sticky and plastic; common very fine to coarse roots; common very fine tubular and many fine medium irregular pores; 25 percent stones, 15 percent cobbles and 10 percent pebbles; neutral (pH 6.6); clear wavy boundary. (8 to 15 inches thick).

B21t--21 to 33 inches; yellowish red (5 YR 4/6) very stony clay, strong brown (7.5 YR 5/6) dry; strong medium angular and subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine to coarse roots; common very fine tubular and many fine and medium irregular pores; few moderately thick clay films on ped faces; 30 percent stones, 20 percent cobbles and 10 percent pebbles; neutral (pH 6.6); gradual irregular boundary. (8 to 15 inches thick).

B22t--33 to 47 inches; yellowish red (5 YR 4/8) very stony clay, strong brown (7.5 YR 5/6) dry; stong medium angular and subangular blocky structure; very hard, firm, very sticky and very plastic; few very fine to medium roots; few very fine tubular and common fine and medium irregular pores; many moderately thick clay films on ped faces; 25 percent stones, 15 percent cobbles and 10 percent pebbles; slightly acid (pH 6.4); gradual irregular boundary. (12 to 18 inches thick).

B3t--47 to 64 inches; yellowish red (5 YR 4/8) very stony clay, mixed reddish brown (5 YR 4/4) and strong brown (7.5 YR 5/6) dry; weak medium subangular blocky structure: very hard, firm, very sticky and very plastic; very few fine roots; very few fine tubular pores; many moderately thick clay films on ped faces; common moderately thick black coatings on ped faces; 30 percent stones, 15 percent cobbles, and 10 percent pebbles; slightly acid (pH 6.2). (10 to 35 inches thick).

Type Location: Douglas County, Oregon. The site is located on the 27-2-19.0 road approximately 800 feet South of its junction with 27-2-19.1 road in section 19, T. 27 S., R. 2 W.

Range in Characteristics: The mean annual soil temperature ranges from 50° F. to 55° F. The soils are usually moist and dry for less than 45 consecutive days during the summer months. The thickness of the solum and depth to bedrock are commonly 5 feet or more but in some pedons the solum may be as thin as 40 inches. The soils have ochric epipedons. The amount of rock fragments in the texture control section ranges from 35 to 60 percent.

The A horizon has hue of 5 YR to 7.5 YR, value of 3 or 4 moist and 5 or 6 dry and chroma of 3 or 4 moist and dry. It has loam or clay loam with 20 to 60 percent pebbles and 0 to 15 percent cobbles.

The Bt horizon has hue of 2.5 YR to 7.5 YR, value of 3 or 4 moist and 5 or 6 dry and chroma of 6 to 8 moist and 4 to 6 dry. It is clay, silty clay or heavy silty clay loam with 35 to 50 percent clay and 20 to 40 percent stones, 10 to 25 percent cobbles, and 5 to 30 percent pebbles.

The C horizon where present ranges in texture from very stony clay to very gravelly clay loam.

Competing Series: These are the Harrington and McGinnis series. The Harrington soils lack argillic horizons and are loamy-skeletal. The McGinnis soils have xeric moisture regimes and are low in organic matter with less than 0.9 percent organic carbon in the upper 6 inches of the argillic horizon.

Geographic Setting: The Shivigny soils are on gently sloping to steep uplands in mountainous areas at elevations of 1500 to 3200 feet. These soils are on large old slumps and benches and have slopes 5 to 35 percent. These soils have formed in colluvium weathered from tuffs, breccias, and andesite. The climate is subhumid with cool and wet winters and a short dry period in the summer months. The annual precipitation ranges from 50 to 65 inches. Mean annual temperature is 48° F to 53° F.; the average January temperature is about 37° F.; and the average July temperature is about 63° F. The average frost-free period is 160 to 200 days.

Geographically Associated Soils: These are the Blachly, Honeygrove, Klickitat, and Kilchis series and the competing Harrington series. The Klickitat and Kilchis soils are loamy-skeletal. Blachly soils lack argillic horizons and have less than 35 percent rock fragments in the texture control section. Honeygrove soils have fine textured argillic horizons with less than 35 percent rock fragments.

Drainage and Permeability: Well drained; slow to medium runoff; moderately slow permeability.

Use and Vegetation: Timber production, water supply, and wildlife. Native vegetation is Douglas-fir, salal, western red cedar, red huckleberry, swordfern, and grand fir.

Distribution and Extent: Western slopes of the Cascade Mountains in Southern Oregon. The series is of moderate extent.

Series Proposed: Douglas County, Oregon, 1975. The name is taken from Shivigny Mountain East of Roseburg.

Remarks: These soils are labeled Unit 300 in the BLM soil survey.

Established Series

KLICKITAT SERIES (323)

Taxonomic Class: Loamy-skeletal, mixed, mesic Typic Dystrochrept.

Typifying Pedon: Unit 323 loam - forested. (Colors are for moist soil unless otherwise noted.)

A1--0 to 9 inches; very dark grayish brown (10 YR 3/2) gravelly loam, brown (10 YR 4/3) dry; moderate fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium and few coarse roots; many fine interstitial pores; 25 percent rounded fine gravel; medium acid (pH 5.6); abrupt wavy boundary. (4 to 8 inches thick).

B1--9 to 19 inches; Dark brown (7.5 YR 3/2) gravelly light silty clay loam, brown (7.5 YR 5/4) dry; moderate fine granular structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium and few coarse roots; many fine interstitial pores; 15 percent coarse gravel; strongly acid (pH 5.2); gradual smooth boundary. (5 to 9 inches thick).

B2--19 to 35 inches; dark brown (7.5 YR 4/4) very gravelly light silty clay loam, pinkish gray (7.5 YR 6/2) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and medium roots; common fine and medium tubular pores; 15 percent fine gravel and 30 percent coarse gravel; strongly acid (pH 5.2); clear wavy boundary. (10 to 20 inches thick).

B3--35 to 60 inches plus; dark brown (7.5 YR 4/4) light silty clay loam, light brown (7.5 YR 6/4) dry; weak fine subangular blocky structure; slightly hard, friable, sticky, plastic; few fine roots; few fine and medium tubular pores; 10 percent gravel; strongly acid (pH 5.2). (15 to 30 inches thick).

Type Location: Douglas County, Oregon. The site is located 1/2 mile from the end of the 16.1 road in the NW¼ SW¼, Sec. 5, T. 25 S., R. 2 W.

Series Established: Benton County, Oregon, 1970.

Tentative Series
SRW-TSG
7/74

ABEGG SERIES (360)

Soil Family: Loamy - skeletal, mixed, mesic Ultic Haploxeralfs.

Typical Pedon: Abegg very gravelly sand loam - forested. (Colors are for moist soil unless otherwise noted.)

A--0 to 7 inches; dark yellowish brown (10 YR 3/4) very gravelly sandy loam, pale brown (10 YR 6/3) dry; weak fine granular granular structure; loose, friable, slightly sticky, slightly plastic; common fine and medium roots; few fine and medium pores; 50 percent gravel; neutral (pH 6.8); abrupt smooth boundary. (4 to 10 inches thick).

A3--7 to 14 inches; dark yellowish brown (10 YR 4/3) dry; weak fine granular structure; loose, friable, slightly sticky, slightly plastic; common fine roots; common fine pores; 30 percent gravel; slightly acid (pH 6.4); abrupt smooth boundary. (5 to 12 inches thick).

B1--14 to 19 inches; dark brown (7.5 YR 4/4) dry; weak fine granular structure; loose, friable, sticky, plastic; few fine roots; common medium pores; 30 percent gravel; neutral (pH 6.8); clear smooth boundary. (4 to 10 inches thick).

B2t--19 to 59 inches; dark brown (7.5 YR 4/4) very gravelly coarse sandy clay loam, brown (7.5 YR 5/4) dry; weak medium granular structure; loose, friable, sticky plastic; few fine, medium, and coarse roots; common fine pores; thin continuous clay films; 50 percent gravel; neutral (pH 6.8); clear wavy boundary. (20 to 45 inches).

B3t--59 inches plus; dark brown (7.5 YR 4/4) gravelly coarse sandy clay loam; weak medium granular structure; loose, friable, sticky, plastic; few fine roots; few fine pores; moderately thick continuous clay films; 25 percent gravel; neutral (pH 6.8).

Type Location: Douglas County, Oregon. The site is located in an old clear cut 4.5 miles up the 29-4-20.0 road in the SE¼ SW¼, Sec. 18, T. 29 S., R. 4 W.

Tentative Series
SRW-TSG-AON
10/75

CHAMATE SERIES (362)

The Chamate series consists of somewhat deep, excessively drained soils that formed in colluvium weathered from welded tuffs. Chamate soils are on steep sidehills and have slopes of 10 to 90 percent. The mean annual precipitation is about 45 inches and the mean annual air temperature is about 52° F.

Taxonomic Class: Loamy-skeletal, mixed, mesic Dystric Xerochrept.

Typical Pedon: Chamate very gravelly loam, forested. (Colors are for moist soil unless otherwise noted.)

O1--1/2 to 0 inches; Douglas-fir needles and cones, lichens, moss.

A1--0 to 7 inches; dark grayish brown (10 YR 4/2) very gravelly loam, light brownish gray (10 YR 6/2) dry; single grained; loose, nonsticky and nonplastic; many very fine and fine and few medium roots; 80 percent fine pebbles; slightly acid (pH 6.4); abrupt smooth boundary. (4 to 8 inches thick).

A3--7 to 15 inches; dark brown (10 YR 3/3) gravelly loam, light gray (10 YR 7/2) dry: moderate medium granular structure; soft, friable, nonsticky and nonplastic; many very fine and fine roots; common very fine tubular pores; 45 percent pebbles; neutral (pH 6.6); clear smooth boundary. (6 to 9 inches thick).

B21--15 to 23 inches; brown (10 YR 4/3) gravelly loam, light gray (10 YR 7/2) dry; weak medium subangular blocky parting to weak medium granular structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine to medium roots; many very fine to medium irregular and tubular pores; 45 percent pebbles; neutral (pH 6.6); gradual wavy boundary. (15 to 25 inches thick).

B22--33 to 56 inches; brown (10 YR 5/3) very gravelly loam, very pale brown (10 YR 7/3) dry; weak medium and coarse subangular blocky structure; slightly hard, firm, slightly sticky, slightly plastic; few fine roots; many very fine and fine tubular and interstitial pores; 55 percent pebbles; neutral (pH 6.8); clear wavy boundary. (25 to 35 inches thick).

C--56 to 65 inches; brown (10 YR 5/3) very gravelly loam; massive very friable, soft, nonsticky, and nonplastic; common very fine to medium roots; many very fine and fine pores; 80 percent hard and weathered welded tuff pebbles and cobbles; neutral (pH 6.8).

Type Location: Douglas County, Oregon. The site is located 100 yards short of the end of the 27-3-12.1 road in the NE¼ NE¼, section 13, T. 27 S., R. 3 W.

Range in Characteristics: The mean annual soil temperature ranges from 52° to 57° F. Depth to bedrock dominantly ranges from 60 to 120 inches. The amount of rock fragments in the texture control section ranges from 40 to 65 percent.

The A horizon has value of 5 through 7 dry and 4 through 5 moist and chroma of 2 through 3 dry and 2 through 4 moist. It is loam or sandy loam with 35 to 80 percent weathered fragments of welded tuffs.

The B horizon has value of 4 or 5 moist and 6 or 7 dry and chroma of 3 or 4 moist and 2 or 3 dry. It is loam or sandy loam with 40 to 60 percent partially weathered angular fragments of welded tuffs and less than 18 percent clay. Clear quartz sand grains are common.

The C horizon has 50 to 85 percent rock fragments mostly pebbles and cobbles.

Competing Series: These are the Atring, Jumpe, Kanid, Olete, Smokey, Skykomish, and Treble series. Atring, Olete, and Smokey soils are 20 to 40 inches to bedrock. Atring and Smokey soils have a paralithic contact and Olete soils have a lithic contact. Jumpe soils are strongly or very strongly acid, commonly have thin A2 horizons and have formed in glacial till from basic igneous rock. Kanid soils have heavy loam and clay loam B horizons with 18 to 30 percent clay. Skykomish soils have Bir horizons and coarse-textured lower B and C horizons of glacial outwash origin. Treble soils have Bir horizons and have formed in glacial till capped by a mantle of volcanic ash.

Geographic Setting: Chamate soils are below escarpments of hard, massive welded tuff. They are in the concave positions on slopes over 70 percent and on sidehills, ridge noses, and draws on slopes 10 to 70 percent. The soils formed in colluvium weathered from angular fragments of welded tuff that have flaked off the rock outcrops above these soils. Elevations range from 800 to 2500 feet. The climate is characterized by cool moist winters and warm dry summers with precipitation ranging from 35 to 50 inches. The average annual temperature is 50° to 55° F.; average January temperature is 39° F.; and average July temperature is 66° F. The frost-free season is about 160 to 230 days.

Geographically Associated Soils: These are the Freezener, Shippa, and Vena soils. Freezener soils have clayey argillic horizons and have 5 YR hues. Shippa soils are 10 to 20 inches deep to bedrock. Vena soils are 20 to 40 inches deep to bedrock.

Drainage and Permeability: Somewhat excessively drained; medium to very rapid runoff; moderately rapid permeability.

Use and Vegetation: Timber production, water supply, wildlife, and road surfacing material. Native vegetation is Douglas-fir, salal, incense cedar, poison oak, and wild rose.

Distribution and Extent: East central and Southern Douglas County, Oregon. The series is of minor extent.

Series Proposed: Douglas County, Oregon, 1975. Name is coined.

Remarks: These soils are labeled Unit 362 in the BLM soil survey.

Tentative Series
SRW-TSG-ANON
10/75

KANID SERIES (370)

The Kanid series consists of deep well drained soils that formed in colluvium weathered from metamorphosed sandstone. Kanid soils are on steep mountainous slopes with slope gradients of 40 to 70 percent. The annual precipitation is about 40 inches and the annual air temperature is about 54° F.

Taxonomic Class: Loamy-skeletal, mixed, mesic Dystric Xerochrept.

Typical Pedon: Kanid very gravelly loam, forested. (Colors are for moist soil unless otherwise noted.)

O1--1 to 0 inches; Douglas-fir needles, bark, leaves and twigs.

A1--0 to 6 inches; very dark grayish brown (10 YR 3/2) very gravelly loam, light brownish gray (10 YR 6/2) dry; weak fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine and fine irregular pores; 45 percent pebbles and 10 percent cobbles; slightly acid (pH 6.4); clear irregular boundary. (4 to 8 inches thick).

B21--6 to 19 inches; brown (10 YR 4/3) very gravelly heavy loam, very pale brown (10 YR 7/2) dry; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and few fine and medium roots; many very fine and fine irregular and many fine tubular pores; 70 percent fine pebbles; neutral (pH 6.6); gradual wavy boundary. (10 to 15 inches thick).

B22--19 to 37 inches; dark yellowish brown (10 YR 4/4) very gravelly light clay loam, light yellowish brown (10 YR 6/4) dry; moderate fine and medium subangular blocky structure; slightly

hard, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; many very fine to irregular medium and many very fine tubular pores; 45 percent pebbles; neutral (pH 6.6); gradual irregular boundary. (15 to 20 inches thick).

B3--37-48 inches plus; dark brown (7.5 YR 4/4) very gravelly light clay loam, light yellowish brown (10 YR 6/4) dry; weak medium sub-angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic, few very fine roots; common very fine irregular pores; 45 percent pebbles and 20 percent cobbles; medium acid (pH 5.8).

Type Location: Douglas County, Oregon. The site is located on the 19.0 road approximately 1/8 mile South of its junction with the 11.0 road in the NE¼ SE¼, section 11, T. 31 S., R. 8 W.

Range in Characteristics: The mean annual soil temperature ranges from 54° to 58° F. The thickness of the solum ranges from 40 to 60 inches. Rock fragments of partially weathered metasedimentary and volcanic rocks range from 35 to 80 percent. The amount increases with depth. Depth to bedrock commonly is 60 inches or more.

The A horizon has hue of 10 YR or 7.5 YR, value of 3 or 4 moist, 5 or 6 dry, and chroma of 2 through 4 moist and 3 or 4 dry.

The B horizon has hue of 10 YR or 7.5 YR, value of 3 through 5 moist and 5 through 7 dry, and chroma of 4 to 5 moist and dry. It ranges from very gravelly and heavy loam or silt loam to very gravelly clay loam with 18 to 30 percent clay. A few pedons have very thin clay films.

The C horizon where present has 60 to 95 percent rock fragments and commonly is a loam.

Competing Series: These are the Atring, Chamate, Jumpe, Olete, Smokey, Skykomish, and Treble series. Atring and Smokey soils are 20 to 40 inches deep to paralithic contact. Olete soils are 20 to 40 inches deep to a lithic contact. Chamate soils have less than 18 percent clay in the B horizons. Jumpe soils are strongly or very strongly acid, commonly have A2 horizons and have formed in glacial till from basic igneous origin. Skykomish soils have Bir horizons and coarse-textured lower B and C horizons of glacial outwash origin. Treble soils have Bir horizons and have formed in glacial till capped by a mantle of volcanic ash.

Geographic Setting: Kanid soils are on mountainous slopes between 35 and 70 percent. They are on sideslopes and old draws that are filled with sediments. Elevations range from 700 to 3200 feet. Kanid soils formed in colluvium weathered from metasedimentary, metavolcanic, and sedimentary rocks. The winters

are cool moist and summers are warm dry. Mean January air temperature is about 40° F.; the mean July temperature is about 67° F.; the average annual temperature is 52° to 56° F. The frost-free season is 120 to 180 days. Precipitation ranges from 30 to 50 inches.

Geographically Associated Soils: These are the Beekman, McGinnis, Pollard, Tishar, and Vermisa soils. McGinnis, Pollard, and Tishar soils are clayey and have argillic horizons. Beekman soils are 20 to 40 inches deep to paralithic contact. Vermisa soils are 12 to 20 inches to a lithic contact.

Drainage and Permeability: Well drained; rapid to very rapid runoff; moderately rapid permeability.

Use and Vegetation: Timber production, grazing, wildlife, and watershed. Native vegetation is Douglas-fir, incense cedar, ponderosa pine, poison oak, tan oak, and grasses.

Distribution and Extent: Southwestern part of Oregon in the Coast Range and Siskiyou Mountains. The series is moderately extensive.

Series Proposed: Douglas County, Oregon, 1975. The name is coined.

Remarks: Kanid soils are labeled Unit 370 in the BLM soil survey.

Established Series
SRW-TSG
7/75

BEEKMAN SERIES (371)

Soil Family: Loamy - skeletal, mixed, mesic Dystric Xerochrepts

Typical Pedon: Beekman very gravelly loam - forested. (Colors are for moist soil unless otherwise noted.)

O1--1 to 0 inches; Douglas-fir needles, bark, twigs.

A1--0 to 4 inches; very dark grayish brown (10 YR 3/2) very gravelly loam, grayish brown (10 YR 5/2)dry; moderate fine granular structure; slightly hard, very friable, slightly sticky, slightly plastic; many very fine, fine, and medium roots; many fine and medium interstitial pores; 40 percent fine gravel; neutral (pH 6.6); clear wavy boundary. (3 to 10 inches thick).

B1--4 to 12 inches; brown (10 YR 4/3) very gravelly loam, light gray (10 YR 7/2) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; common fine and medium tubular pores; 40 percent fine gravel and 5 percent gravel; neutral (pH 6.6); clear wavy boundary. (5 to 10 inches thick).

B2--12 to 26 inches; dark yellowish brown (10 YR 4/4) very gravelly clay loam, very pale brown (10 YR 7/3) dry; moderate fine subangular blocky structure; hard, friable, sticky, plastic; common fine and medium and few coarse roots; common fine and medium tubular pores; 30 percent fine gravel and 15 percent coarse gravel and 10 percent cobbles; slightly acid (pH 6.4); clear wavy boundary. (10 to 20 inches thick).

B3--26 to 34 inches; yellowish brown (10 YR 5/6) very gravelly light clay loam, very pale brown (10 YR 7/3) dry; weak fine and medium subangular blocky structure; slightly hard, friable, sticky, plastic; common fine and medium roots; common fine and medium tubular and interstitial pores; 5 percent fine gravel, 15 percent coarse gravel, 45 percent cobbles; slightly acid (pH 6.2); clear wavy boundary. (0 to 10 inches thick).

R--34 inches plus; slightly fractured, slightly weathered siltstone, with some fractures not filled with fines.

Type Location: Douglas County, Oregon. The site is located on the 3.0 road 3/4 miles South of its junction with the 10.1 road in the NE¼ SE¼, Sec. 10, T. 31 S., R. 8 W.

Tentative Series
SRW-TSG-AON
11/75

VERMISA SERIES (372)

The Vermisa series consists of shallow somewhat excessively drained soils that formed in colluvium weathered from metasedimentary, metavolcanic, and sedimentary rocks. Vermisa soils have very steep mountainous terrain and have slopes of 60 to 100 percent. The annual precipitation is about 40 inches and the annual air temperature is about 54° F.

Taxonomic Class: Loamy-skeletal, mixed, mesic Lithic Xerochrept.

Typical Pedon: Vermisa very gravelly loam, forested. (Colors are for moist soil unless otherwise noted.)

A1--0 to 4 inches; dark yellowish brown (10 YR 4/4) very gravelly loam, light gray (10 YR 7/2) dry; weak fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine to medium roots; many very fine irregular pores; 70 percent pebbles and 5 percent cobbles; neutral (pH 6.8); clear wavy boundary. (3 to 7 inches thick).

B2--4 to 17 inches; yellowish brown (10 YR 5/4) very gravelly loam, very pale brown (10 YR 7/3) dry; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine to medium roots; common very fine to medium tubular pores;

10 percent fine pebbles and 45 percent coarse pebbles and 20 percent cobbles; slightly acid (pH 6.4); clear wavy boundary. (8 to 14 inches thick).

R--17 inches plus; hard fractured metamorphosed graywacke with cracks greater than 4 inches apart.

Type Location: Douglas County, Oregon. The site is located on the 15.0 road about 1/2 mile from its junction with the 3.0 road in the SW¼ NE¼, Section 15, T. 31 S., R. 8 W.

Range in Characteristics: The mean annual soil temperature ranges from 54° F. to 58° F. The soils are usually moist but dry for 60 to 80 days during the summer months. The thickness of the solum and depth to hard slightly fractured bedrock range from 10 to 20 inches. Rock fragments of metasedimentary, metavolcanic and sedimentary rock range from 35 to 80 percent with the average being about 50 percent. The hue is 10 YR or 7.5 YR.

The A horizon has value of 4 or 5 moist, 6 to 7 dry and chroma of 2 through 4 moist and dry. Texture ranges from loam to silt loam with 20 to 75 percent pebbles and cobbles.

The B horizon has value of 4 or 5 moist, 6 to 7 dry and chroma of 4 or 5 moist and 3 through 5 dry. Texture is loam or silt loam with 18 to 27 percent clay and 35 to 60 percent pebbles and 15 to 30 percent cobbles.

Competing Series: These are the Deadwood, Goulding, Shippa, Slab and Larmine series. Deadwood soils have less than 60 percent base saturation throughout the solum and commonly have moderately coarse textured B horizons. Goulding soils lack dry color values of 6 in their sola and are formed in weathered greenstone. Shippa soils have less than 60 percent base saturation throughout the solum. Slab soils commonly have A2 horizons and have base saturation of less than 60 percent throughout the solum. Larmine soils have less than 18 percent clay in the B horizons.

Georgraphic Setting: Vermisa soils are on very steep sideslopes, canyon walls, and steep headwalls. Slopes range from 60 to 100 percent. Elevations range from 700 to 3200 feet. Vermisa soils have developed in colluvium weathered from metasedimentary and metavolcanic rocks. The winters are cool and moist and summers are hot and dry. Mean January temperature is 40° F.; the mean July temperature is 67° F.; the average annual temperature is 52° to 56° F. The frost-free season is 120 to 180 days. Precipitation ranges from 30 to 50 inches.

Geographically Associated Soils: These are the Beekman, Kanid, McGinnis, Pollard and Tishar series. Beekman soils have fragmental horizons. Kanid soils are deeper than 60 inches to bedrock. Pollard, Tishar, and McGinnis soils are clayey and have argillic horizons.

Drainage and Permeability: Somewhat excessively drained; rapid and very rapid runoff; moderately rapid permeability.

Use and Vegetation: Timber production, wildlife, and watershed. Native vegetation is Douglas-fir, poison oak, canyon live oak, and grasses.

Distribution and Extent: Southwest part of Oregon in the Coast Range and Siskiyou Mountains. The series is moderately extensive.

Series Proposed: Douglas County, Oregon, 1975. The name is coined.

Remarks: Vermisa soils are labeled Unit 372 in the BLM soil survey.

Tentative Series
SRW
4/71

POLLARD SERIES (380)

Soil Family: Clayey, mixed, mesic Typic Haploxerults.

Typical Pedon: Pollard clay loam - forested. (Colors are for moist soil unless otherwise noted.)

A1--0 to 8 inches; dark brown (7.5 YR 5/5) clay loam, brown (7.5 YR 5/4) dry; strong fine granular structure; slightly hard, friable, slightly sticky, plastic; abundant fine and medium, and few large roots; many interstitial pores; slightly acid (pH 6.4); abrupt smooth boundary. (4 to 8 inches thick).

B1--8 to 16 inches; yellowish red (5 YR 4/6) clay loam, light reddish brown (5 YR 6/4) dry; strong medium subangular blocky structure; slightly hard, friable, sticky, plastic; abundant fine, plentiful medium and few large roots; many interstitial pores; 10 percent pebbles; medium acid (pH 6.2) clear smooth boundary. (3 to 8 inches thick).

B2t--16 to 40 inches; red (2.5 YR 4/6) clay, red (2.5 YR 5/6) dry; strong medium and moderate fine subangular blocky structure; hard, firm, sticky, plastic; plentiful fine and few medium roots; many very fine tubular pores; common thin and few moderately thick clay films; 10 percent pebbles; few black stains; medium acid (pH 6.0); clear smooth boundary. (20 to 28 inches thick).

B3--40 to 70 inches; red (2.5 YR 4/6) gravelly clay, red (2.5 YR 5/7) dry; medium and fine subangular blocky structure; hard, firm, sticky, plastic; many very fine tubular pores; few thin clay films; 15 percent pebbles, few black stains; medium acid (pH 5.8); (27 to 35 inches thick).

Type Location: Douglas County, Oregon. About 3.5 miles Northeast of West Fork along BLM timber access road 32-7-6.0 in the SW¼ SE¼, Sec. 29, T. 31 S., R. 7 W., Willamette Meridian.

Tentative Series
SRW-TSG-AON
12/75

McGINNIS SERIES (381)

The McGinnis series consists of moderately deep, well drained soils that formed in colluvium weathered from metasedimentary, metavolcanic, and sedimentary rocks. McGinnis soils are on moderately steep to steep slopes in mountainous areas and have slopes of 20 to 50 percent. The annual precipitation is about 40 inches and annual air temperature is about 53° F.

Taxonomic Class: Clayey-skeletal, mixed, mesic Typic Haploxerults.

Typical Pedon: McGinnis very gravelly clay loam, forested. (Colors are for moist soil unless otherwise noted.)

O1--1/2 inch to 0; bear grass stems, lichens, Douglas-fir bark and needles.

A1--0 to 6 inches; reddish brown (5 YR 4/3) very gravelly clay loam, yellowish red (5 YR 5/6) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many fine and medium irregular and many very fine tubular pores; 55 percent pebbles; slightly acid (pH 6.2); clear smooth boundary. (4 to 8 inches thick).

B1--6 to 14 inches; yellowish red (5 YR 4/6) gravelly clay, reddish yellow (5 YR 6/6) dry; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and many fine and few coarse roots; many fine and medium irregular and many very fine tubular pores; 30 percent pebbles; strongly acid (pH 5.4); clear smooth boundary. (6 to 12 inches thick).

B21t--14 to 19 inches; yellowish red (5 YR 4/6) very gravelly clay, reddish yellow (5 YR 6/6) dry; strong medium subangular blocky structure; hard, firm, sticky and plastic; common fine and medium roots; common fine and medium irregular and few very fine tubular pores; many moderately thick clay skins on ped faces; 50 percent pebbles and 10 percent cobbles; strongly acid (pH 5.4); clear wavy boundary. (4 to 7 inches thick).

B22t--19 to 31 inches; yellowish red (5 YR 4/8) very gravelly clay, reddish yellow (5 YR 6/6) dry; strong medium subangular blocky

structure; hard, firm, sticky and plastic; few fine roots; common fine and medium and irregular and few very fine tubular pores; many moderately thick clay skins on ped faces; 60 percent pebbles; medium acid (pH 5.6); clear irregular boundary. (10 to 14 inches thick).

Cr--31 inches; soft, highly fractured Umpqua sandstone with continuous moderately thick clay skins on rock fragments.

Type Location: Douglas County, Oregon. The site is located on the 29.2 road approximately 100 yards from its junction with the 9.0 road in the NW¼ SE¼, section 9, T. 30 S., R. 8 W.

Range in Characteristics: The mean annual soil temperature ranges from 52° to 58° F. The soils are usually moist but dry for 60 to 80 consecutive days during the 120 day period following the summer solstice. Solum thickness and depth to bedrock are 20 to 40 inches. The amount of rock fragments ranges from 35 to 55 percent.

The A horizon has hue of 7.5 YR to 5 YR, value of 3 or 4 moist, 5 through 7 dry, and chroma of 3 or 4 moist and 4 through 6 dry. It is loam to clay loam with 25 to 60 percent pebbles.

B2 horizon has hue of 5 YR or 2.5 YR, value of 3 or 4 moist, 4 through 6 dry, and chroma of 6 through 8 moist or day. It is clay to heavy clay loam with 35 to 50 percent clay and 35 to 60 percent rock fragments.

The Cr horizon commonly is soft fractured sandstone, siltstone, graywacke, or metamorphosed andesite, Hard unweathered rock is deeper than 6 feet.

Competing Series: These are the Cobleigh, Dumont, Pollard and Tishar series. Cobleigh soils have greater than 35 percent base saturation in all parts of the argillic horizon and have less than 35 percent rock fragments. Dumont soils are deep and have less than 35 percent rock fragments. Tishar soils are deeper than 40 inches to bedrock.

Geographic Setting: McGinnis soils are on moderately steep to steep uplands and have slopes of 20 to 50 percent. Elevations range from 700 to 3200 feet. The soils formed in colluvium weathered from metasedimentary, metavolcanic, and sedimentary rocks. The climate is characterized by cool moist winters and warm dry summers. The mean January temperature is 40° F.; the mean July temperature is 67° F.; the average annual temperature is 50° F. to 56° F. Precipitation ranges from 30 to 50 inches. The frost-free season is 120 to 180 days.

Geographically Associated Soils: These are the Beekman, Kanid, and Vermisa series, and the competing Pollard and Tishar soils. Beekman, Kanid, and Vermisa soils are loamy-skeletal.

Drainage and Permeability: Well drained, medium to rapid runoff, moderately slow permeability.

Use and Vegetation: Timber production, grazing, wildlife, and watershed. Native vegetation is Douglas-fir, incense cedar, ponderosa pine, sugar pine, poison oak, madrone and grasses.

Distribution and Extent: Southeast part of Oregon in the Coast Range and Siskiyou Mountains. The series is minor in extent.

Series Proposed: Douglas County, Oregon, 1975. The name is taken from McGinnis Creek.

Remarks: McGinnis soils are labeled Unit 381 in the BLM soil survey.

Tentative Series
SRW-TSG-AON
12/75

TISHAR SERIES (382)

The Tishar series consists of deep, well drained soils that formed in colluvium weathered from metasedimentary, metavolcanic and sedimentary rocks. Tishar soils are on moderately steep to steep slopes in mountainous areas and have slopes of 20 to 50 percent. The annual precipitation is about 40 inches and annual air temperature is about 53° F.

Taxonomic Class: Clayey-skeletal, mixed, mesic, Typic Haploxerults.

Typical Pedon: Tishar gravelly silty clay loam, forested. (Colors are for moist soil unless otherwise noted.)

O1--1 inch to 0; lichens, moss, twigs.

A1--0 to 6 inches; dark brown (7.5 YR 3/2) gravelly light silty clay loam, light brown (7.5 YR 6/4) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine to medium irregular pores; 20 percent pebbles; medium acid (pH 5.8); clear wavy boundary. (4 to 8 inches thick).

A3--6 to 13 inches; dark brown (7.5 YR 4/4) gravelly silty clay loam, light brown (7.5 YR 6/4) dry; moderate fine subangular blocky structure; hard, firm, sticky and plastic; common fine medium and coarse roots; few very fine tubular pores; common thin clay skins on ped faces; 50 percent pebbles; strongly acid (pH 5.4); gradual smooth boundary. (7 to 10 inches thick).

B1--13 to 22 inches; yellowish red (5 YR 4/6) very gravelly silty clay, pink (7.5 YR 7/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; common fine medium

and coarse roots; few very fine tubular pores; common thin clay skins on ped faces; 50 percent pebbles; strongly acid (pH 5.4); gradual smooth boundary. (7 to 10 inches thick).

B21t--22 to 40 inches; yellowish red (5 YR 4/6) very gravelly clay, reddish yellow (5 YR 6/6) dry; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few fine and medium roots; few very fine tubular pores; many moderately thick clay skins on ped faces; 50 percent pebbles; strongly acid (pH 5.2); gradual smooth boundary. (20 to 30 inches thick).

B22t--40 to 52 inches; yellowish red (5 YR 4/6) very gravelly clay, reddish yellow (7.5 YR 6/6) dry; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; few very fine tubular pores; many moderately thick clay skins on ped faces; 50 percent pebbles; strongly acid (pH 5.2); clear wavy boundary. (10 to 30 inches thick).

Cr--52 inches; weathered fractured siltstone bedrock.

Type Location: Douglas County, Oregon. The site is located on the 19.0 road 1/2 mile East of its junction with the 9.0 road in the SE¼ SE¼, section 5, T. 31 S., R. 8 W.

Range in Characteristics: The mean annual soil temperature ranges from 52° to 58° F. The soils are usually moist but dry for 60 to 80 consecutive days during the 120 day period following the summer solstice. The solum thickness and depth to bedrock range from 40 to 60 inches. The amount of rock fragments in the control section ranges from 35 to 60 percent.

The A horizon has hue of 7.5 YR or 5 YR, value of 3 through 5 moist, 6 or 7 dry, and chroma of 2 through 4 moist and dry. It is clay loam or silty clay loam with 20 to 35 percent pebbles.

The B2t horizon has hue of 5 YR or 2.5 YR, value of 4 or 5 moist, 5 through 7 dry, and chroma of 6 or 8 moist or dry. It is clay or silty clay with 40 to 50 percent clay and 35 to 60 percent rock fragments.

Competing Series: These are the Cobleigh, Dumont, McGinnis, and Pollard series. Cobleigh soils have more than 35 percent base saturation in the lower part of the argillic horizon and have less than 35 percent rock fragments. Dumont and Pollard soils have less than 35 percent rock fragments in the texture control section. McGinnis soils are 20 to 40 inches deep to a paralithic contact.

Geographic Setting: Tishar soils are on moderately steep to steep uplands and have slopes of 20 to 50 percent. Elevations range from 700 to 3200 feet. The soils formed in colluvium weathered

from metasedimentary, metavolcanic and sedimentary rocks. The climate is characterized by cool moist winters and warm dry summers. The mean January temperature is 40° F; the mean July temperature is 67° F.; the average annual temperature is 50° to 56° F. Precipitation ranges from 30 to 50 inches. The frost-free season is 120 to 180 days.

Geographically Associated Soils: These are the Beekman, Kanid, and Vermisa series, and the competing Pollard and McGinnis series. Beekman, Kanid, and Vermisa soils are loamy-skeletal.

Drainage and Permeability: Well drained, medium to rapid runoff; moderately slow permeability.

Use and Vegetation: Timber production, grazing, wildlife, and watershed. Native vegetation is Douglas-fir, incense-cedar, ponderosa pine, sugar pine, poison oak, madrone, and grasses.

Distribution and Extent: Southwest part of Oregon in the Coast Range and Siskiyou Mountains. The series is minor in extent.

Series Proposed: Douglas County, Oregon, 1975. The name is coined.

Remarks: Tishar soils are labeled Unit 382 in the BLM soil survey.

Tentative Series
SRW-TSG-AON
11/75

LARMINE SERIES (393)

The Larmine series are shallow, somewhat excessively drained soils formed in colluvium weathered from sandstone and siltstone. Larmine soils are on very steep mountainous topography and have slopes of 60 to 100 percent. The annual precipitation is 30 to 50 inches and the annual air temperature is 50° F. to 55° F.

Taxonomic Class: Loamy-skeletal, mixed, mesic Lithic Xerochrept.

Typical Pedon: Larmine gravelly loam, forested. (Colors are for moist soil unless otherwise noted.)

A1--0 to 3 inches; dark grayish brown (10 YR 4/2) gravelly loam, light brownish gray (10 YR 6/2) dry; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine and few medium roots; many very fine tubular and irregular pores; 30 percent fine pebbles; slightly acid (pH 6.4); clear wavy boundary. (3 to 5 inches thick).

B3--3 to 12 inches; yellowish brown (10 YR 5/4) very gravelly loam, very pale brown (10 YR 7/3) dry; weak medium and coarse subangular

blocky structure; hard, friable, slightly sticky, slightly plastic; many fine and medium roots; many very fine to medium tubular pores; 50 percent pebbles and cobbles; medium acid (pH 5.6); clear wavy boundary. (7 to 12 inches thick).

B3--12 to 19 inches; yellowish brown (10 YR 5/4) very gravelly loam, very pale brown (10 YR 7/4) dry; weak medium granular structure; hard, friable, slightly sticky and slightly plastic; common very fine, medium and coarse roots; common very fine to medium irregular pores; 80 percent pebbles and cobbles; neutral (pH 6.6); gradual wavy boundary. (4 to 7 inches thick).

R--19 inches; fractured sandstone with cracks more than 4 inches apart.

Type Location: Douglas County, Oregon. The site is located on the 29.0 road approximately 1/8 mile South of the 30.1 road junction in the NE¼ NE¼, section 24, T. 25 S., R. 7 W.

Range in Characteristics: The mean annual soil temperature ranges from 52° to 57° F. The soils are usually moist but dry from 60 to 80 days during the summer months. The solum contains 35 to 80 percent rock fragments. Depth to hard bedrock is 10 to 20 inches.

The A horizon has value of 3 through 5 moist, 6 or 7 dry and chroma of 2 through 4 dry. It is loam to silt loam with 20 to 55 percent pebbles.

The B horizon has hue of 7.5 YR or 10 YR, value of 4 or 5 moist, 6 or 7 dry and chroma of 3 through 6 moist and 3 or 4 dry. It is loam or silt loam with less than 18 percent clay and 30 to 60 percent pebbles and 5 to 20 percent cobbles.

The bedrock is massive to fractured sandstone and siltstone. The cracks commonly are more than 4 inches apart.

Competing Series: These are the Deadwood, Goulding, Shippa, Slab and Vermisa series. Deadwood soils have less than 60 percent base saturation throughout the solum and commonly are moderately coarse textured. Goulding soils have gravelly or very gravelly heavy loam or clay loam B horizons. Slab soils commonly have A2 horizons and base saturation of less than 60 percent throughout the solum. Shippa soils have less than 60 percent base saturation, have formed from weathered metavolcanic rocks and andesite, and have greater than 18 percent clay in the B horizons. Vermisa soils have more than 18 percent clay in the B horizon and overlie metavolcanic and metasedimentary bedrock.

Geographic Setting: Larmine soils are on very narrow ridgetops, steep sideslopes, and headwalls in mountainous areas. They are on slopes 60 to 100 percent. Elevations range from 800 to 2600 feet.

The soils have formed in colluvium weathered from sandstone and siltstone of the Umpqua and Tyee formations. The climate is characterized by cool moist winters and dry warm summers with precipitation ranging from 35 to 50 inches. Mean January temperature is 39° F.; the mean July temperature is 66° F.; and the average annual temperature is 50° to 55° F. The frost-free season is about 160 to 210 days.

Geographically Associated Soils: These are the Atring, Bateman, Bellpine, Jory, and Renhaven series. Atring soils are 20 to 40 inches deep to paralithic contact. Jory, Bateman, and Bellpine soils have fine textured argillic horizons. Renhaven soils are fine-loamy and 40 to 60 inches deep to bedrock.

Drainage and Permeability: Excessively well drained; very rapid runoff; rapid permeability.

Use and Vegetation: Timber production, some grazing, wildlife, and watershed. Natural vegetation is Douglas-fir with scattered incense cedar, hazel, poison oak, and grasses.

Distribution and Extent: Eastern side of the Coast Range in northern Douglas County and southern Lane County. The series is moderately extensive.

Series Proposed: Douglas County, Oregon, 1975. The name is coined.

Remarks: Larmine is labeled Unit 393 in the BLM soil survey.

Tentative Series
SRW-TSG-AON
10/75

ATRING SERIES (394)

The Atring series consists of moderately deep, well drained soils that formed in colluvium weathered from sandstone and siltstone. Atring soils are in steep mountainous areas and have slopes of 50 to 90 percent. The mean annual precipitation is about 40 inches and mean annual air temperature is about 52° F.

Taxonomic Class: Loamy-skeletal, mixed, mesic Dystric Xerochrept.

Typical Pedon: Atring gravelly loam, forested. (Colors are for moist soil unless otherwise noted.)

O1--2 to 0 inches; Douglas-fir needles and cones, bark, lichen.

A1--0 to 9 inches; dark grayish brown (10 YR 4/2) gravelly loam, light gray (10 YR 7/2) dry; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky

and slightly plastic; many very fine and fine roots; many very fine irregular pores; 20 percent pebbles; slightly acid (pH 6.4) clear wavy boundary. (6 to 12 inches thick).

B2--9 to 20 inches; brown (10 YR 4/3) very gravelly loam, very pale brown (10 YR 7/3) dry; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine irregular pores; 20 percent pebbles; slightly acid (pH 6.4); clear wavy boundary. (6 to 12 inches thick).

B3--20 to 35 inches; yellowish brown (10 YR 5/6) very gravelly loam, very pale brown (10 YR 7/4) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine to medium roots; common very fine to medium tubular pores; 50 percent coarse gravel and cobbles; medium acid (pH 6.0); clear wavy boundary. (10 to 18 inches thick).

Cr--35 inches; sandstone; can be cut with spade and knife.

Type Location: Douglas County, Oregon. The site is located on the 19.1 road one-half mile West of its junction with the 1.2 road in the NW¼ SW¼, Section 1, T. 25 S., R. 7 W.

Range in Characteristics: The mean annual soil temperature ranges from 52° to 57° F. The solum contains 35 to 60 percent rock fragments. The A and B horizons have hue of 10 YR or 7.5 YR. The soils have an ochric epipedon.

The A horizon has value of 3 to 5 moist, 6 to 7 dry, and chroma of 4 through 6 moist and 2 to 3 dry. It is very gravelly loam or very gravelly silt loam.

The B horizon has value of 4 or 5 moist, 6 or 7 dry and chroma of 4 through 6 moist, 4 or 5 dry. It is very gravelly loam or very gravelly silt loam.

The C horizon where present has soft fragments of sandstone with soil material that ranges in texture loam to sandy loam.

Competing Series: These are the Chamate, Jumpe, Kanid, Olete, Smokey, Skykomish, and Treble series. Chamate, Jumpe, Kanid, Skykomish and Treble soils are all deeper than 40 inches to bedrock. Olete soils have hue of 2.5 YR and 5 YR in the B horizons and have a lithic contact at depths of 20 to 40 inches. Smokey soils have strongly to very strongly acid profiles.

Geographic Setting: Atring soils are on narrow ridgetops and sideslopes. They commonly have slopes of 50 to 90 percent. Elevations range from 800 to 2600 feet. The soils have formed in colluvium weathered from sandstone and siltstone of the Tyee and

Umpqua formations. The soils have a climate of cool moist winters and dry warm summers with precipitation ranging from 35 to 40 inches. Mean January temperature is 39° F; the mean July temperature is 66° F.; the average annual temperature is 50° to 55° F. The frost free season is about 160 to 210 days.

Geographically Associated Soils: These are the Batemen, Bellpine, Jory, Larmine, Oakland, and Renhaven soils. Bateman, Bellpine, Jory and Oakland soils are fine textured and have argillic horizons. Larmine soils are less than 20 inches deep to a lithic contact. Renhaven soils are fine-loamy and deeper than 40 inches to bedrock.

Drainage and Permeability: Well drained, rapid and very rapid runoff; moderate permeability.

Use and Vegetation: Timber production, some grazing, wildlife, and watershed. Natural vegetation is Douglas-fir with madrone, hazel, poison oak, and grasses.

Distribution and Extent: Eastern side of the Coast Range in Northern Douglas County and Southern Lane County. The series is moderately extensive.

Series Proposed: Douglas County, Oregon, 1975. The name is coined.

Remarks: Atring soils are labeled Unit 394 in the BLM soil survey.

Tentative Series
SRW-TSG-AON
12/75

RENHAVEN SERIES (395)

The Renhaven series consists of deep, well drained soils that formed in colluvium weathered from sandstone and siltstone. Renhaven soils are on steep mountainous uplands and have slopes of 25 to 60 percent. The annual precipitation is about 42 inches and the annual air temperature is about 52° F.

Taxonomic Class: Fine-loamy, mixed, mesic family of Dystric Xerochrepts.

Typical Pedon: Renhaven loam, forested. (Colors are for moist soil unless otherwise noted.)

O1--2 inches to 0; grass stems, fern leaves and fir needles.

A11--0 to 4 inches; brown (10 YR 4/3) loam, light gray (10 YR 7/2) dry; strong fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many very fine to medium irregular pores; 2 percent pebbles; medium acid (pH 6.0); clear wavy boundary. (4 to 6 inches thick).

A12--4 to 13 inches; brown (10 YR 4/3) loam, light brownish gray (10 YR 6/2) dry; moderate medium and coarse granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many very fine and fine irregular pores; 2 percent pebbles; medium acid (pH 6.0); clear wavy boundary. (6 to 10 inches thick).

B1--13 to 26 inches; brown (10 YR 4/3) loam, light gray (10 YR 7/2) dry; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common fine medium and coarse roots; common very fine to medium tubular pores; 5 percent pebbles; medium acid (pH 5.8); clear wavy boundary. (10 to 14 inches thick).

B2--26 to 37 inches; yellowish brown (10 YR 5/4) loam, very pale brown (10 YR 7/3) dry; moderate medium and coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; common fine, medium and coarse roots; common very fine to medium tubular pores; 5 percent pebbles; medium acid (pH 5.8); gradual wavy boundary. (8 to 12 inches thick).

B3--37 to 49 inches; yellowish brown (10 YR 5/5) loam, very pale brown (10 YR 7/4) dry; moderate coarse subangular blocky structure; very hard, friable, slightly sticky and slightly plastic; few fine and common coarse roots; few very fine and fine tubular pores; 5 percent pebbles; medium acid (pH 5.8); abrupt wavy boundary. (10 to 16 inches thick).

Cr--49 inches; partially weathered sandstone.

Type Location: Douglas County, Oregon. The site is located on the 29.0 road 1/2 mile from its junction with the 19.1 road in the SW¼ NW¼, Section 31, T. 24 S., R. 6 W.

Range in Characteristics: The mean annual soil temperature is about 52° F. The soils are usually moist but dry for 60 to 80 consecutive days during the 120 day period following the summer solstice. Depth to bedrock is 40 to 60 inches deep. The amount of pebbles in the solum ranges from about 2 to 25 percent.

The A horizon has value of 3 through 5 moist, 6 or 7 dry, and chroma of 3 through 5 moist and 2 or 3 dry. It is loam, silt loam, or sandy loam.

The B2 horizon has hue of 7.5 YR or 10 YR, value of 4 or 5 moist, 6 or 7 dry, and chroma of 3 through 5 moist, 3 or 4 dry. It is loam, clay loam or silt loam with 18 to 30 percent clay and more than 15 percent coarser than very fine sand.

The Cr horizon is massive to fractured sandstone or siltstone.

Competing Series: These are the Elwha, Heisler, Hugo, Madonna, Mashel, and Tethrick series. Elwha soils have cemented gravelly till at depths of 20 to 40 inches. Heisler soils have A2 and Bir horizons. Hugo soils have more than 20 percent rock fragments in the B horizons. Madonna soils are 20 to 40 inches deep to hard sandstone. Mashel soils are 20 to 40 inches deep to cemented till and have Bir horizons. Tethrick soils are formed in weathered quartz diorite and have more than 20 percent medium and coarser sands.

Geographic Setting: Renhaven soils are on narrow ridgetops, sideslopes, and recent landslides in mountainous areas. They commonly have slopes of 25 to 60 percent. Elevations range from 800 to 2600 feet. The soils formed in colluvium weathered from sandstone and siltstone mostly of the Tyee and Umpqua Formations. The climate is characterized by cool moist winters and dry warm summers with precipitation ranging from 35 to 50 inches. Mean January temperature is 39° F.; the mean July temperature is 66° F; the average annual temperature is 50° to 55° F. The frost-free season is about 160 to 210 days.

Geographically Associated Soils: These are the Atring, Bateman, Bellpine, Jory and Larmine Soils. Bateman, Bellpine, and Jory soils have fine textured argillic horizons. Atring and Larmine soils are loamy-skeletal. Also, the Larmine soils are less than 20 inches deep to bedrock.

Drainage and Permeability: Well drained, rapid and very rapid runoff: moderate permeability.

Use and Vegetation: Timber production, some grazing, wildlife, and watershed. Natural vegetation is Douglas-fir with scattered incense cedar, madrone, hazel, poison oak, and grasses.

Distribution and Extent: Eastern side of the Coast Range in Northern Douglas County and Southern Lane County. The series is moderately extensive.

Series Proposed: Douglas County, Oregon, 1975. The name is from Renhaven Ridge near Kellogg, Oregon.

Remarks: Characterization data for one profile (S74-OR-10-1) by OSU is shown in Table 12. The clay in the control section is 17.5 percent. The 15 ATM moisture tension is 19.1. Most pedons feel finer than coarse-loamy. These soils are labeled Unit 395 in the BLM soil survey.

Tentative Series
SRW-TSG-SON
10/75

BATEMAN SERIES (396)

The Batemen series consists of deep, well drained soils that formed in colluvium weathered from sandstone and siltstone. Batemen soils are on mountainous uplands and have slopes of 5 to 50 percent. The mean annual precipitation is 42 inches and the mean annual air temperature is about 52° F.

Taxonomic Class: Fine, mixed, mesic Ultic Haploxeralfs.

Typical Pedon: Bateman silt loam, forested. (Colors are for moist soil unless otherwise noted.)

A1--0 to 7 inches; dark brown (10 YR 3/3) silt loam, pale brown (10 YR 6/3) dry; moderate fine and medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine to medium roots; many very fine to medium irregular pores; 2 percent pebbles; medium acid (pH 5.6); clear wavy boundary. (6 to 10 inches thick).

B1--7 to 15 inches; dark brown (7.5 YR 4/4) light silty clay loam, light brown (7.5 YR 6/4) dry; weak fine subangular blocky structure; very hard, very friable, slightly sticky and slightly plastic; common very fine and fine and few coarse roots; common very fine to medium tubular pores; very few thin clay skins on ped faces; 2 percent pebbles; strongly acid (pH 5.4); clear wavy boundary. (6 to 9 inches thick).

B21t--15 to 32 inches; dark brown (7.5 YR 4/4) heavy silty clay loam, reddish yellow (7.5 YR 6/6) dry; moderate medium subangular blocky structure; very hard, friable, sticky and plastic; common very fine to coarse roots; few very fine tubular pores; common thin clay skins on ped faces; 5 percent pebbles; strongly acid (pH 5.4); gradual wavy boundary. (12 to 18 inches thick).

B22t--32 to 50 inches; reddish brown (5 YR 4/4) heavy silty clay loam, reddish yellow (7.5 YR 6/6) dry; moderate medium subangular blocky structure; extremely hard, friable, sticky, plastic; common fine and few coarse roots; few very fine tubular pores; many moderately thick clay films on ped faces; 10 percent pebbles; strongly acid) (pH 5.2); gradual wavy boundary. (15 to 35 inches thick).

B3--50 to 60 inches; dark brown (7.5 YR 4/4) gravelly silty clay loam, reddish yellow (7.5 YR 6/6) dry; moderate coarse subangular blocky structure; very hard, friable, slightly sticky, slightly plastic; common fine and few coarse roots; few very fine tubular pores; many moderately thick clay skins on ped faces; 20 percent pebbles; strongly acid (pH 5.2).

Type Location: Douglas County, Oregon. The site is located on the 19.1 road one-half mile South of its junction with the 29.0 road in the NW¼ SE¼, Section 36, T. 24 S., R. 7 W.

Range in Characteristics: The mean annual soil temperature ranges from 52° to 57° F. The solum contains up to 20 percent pebbles. Depth to rock is commonly 10 feet or more.

The A horizon has value of 3 to 5 moist, 6 to 7 dry, and chroma of 4 through 6 moist and 6 to 7 dry. It is clay loam or silt loam.

The B horizon has hue of 7.5 YR or 5 YR, value of 4 or 5 moist, 5 to 7 dry, and chroma of 6 through 8 moist and 6 to 7 dry. It is light silty clay loam to silty clay and averages 35 to 45 percent clay.

The C horizon where present is silty clay loam, clay loam or loam.

Competing Series: These are the Freezener, Jumpoff, Napavine, Oak Grove, Oakland, Salkum, and Veneta series. Freezener soils have A horizons with value of 5 dry, chroma of 4 though 6, and hue of 10 YR, and they have formed in colluvium and residuum weathered mostly from basalt. Jumpoff soils have hue of 10 YR and 5 Y throughout and are 40 to 60 inches deep to weathered tuff and volcanic breccia bedrock. Napavine soils have umbric epipedons and have formed in weathered gravelly glacial drift. Oak Grove soils have umbric epipedons and are slightly to medium acid. Oakland soils are 20 to 40 inches deep to paralithic contact. Salkum soils have highly weathered and mottled lower argillic and C horizons and have A horizons darker than dry value of 6. Veneta soils have more than 60 percent clay in the lower part of the argillic and in the C horizons and lack hue as red as 7.5 YR in any horizon.

Geographic Setting: Bateman soils are on rounded ridgetops, sideslopes, and old landslides. They commonly have slopes of less than 35 percent. Elevations range from 500 to 2600 feet. The soils formed in colluvium weathered from sandstone and siltstone mostly of the Tyee and Umpqua Formations. The soils have a climate of cool moist winters and dry warm summers with precipitation ranging from 35 to 50 inches. Mean January temperature is 39° F; the mean July temperature is 66° F; the average annual temperature is 50° to 55° F. The frost-free season is about 160 to 210 days.

Geographically Associated Soils: These are tha Atring, Bellpine, Jory, Larmine, and Renhaven soils and the competing Oakland series. Jory, Oakland, and Bellpine are competing series. Atring, Renhaven and Larmine soils are loamy-skeletal and lack argillic horizons. Bellpine and Jory soils have less than 35 percent base saturation in the lower argillic horizon. Also Bellpine soils are 20 to 40 inches deep to paralithic contact.

Drainage and Permeability: Well drained; slow to rapid runoff; moderately slow permeability.

Use and Vegetation: Timber production, some farming, grazing, wildlife, watershed. Natural vegetation is Douglas-fir, incense cedar, scattered salal, madrone, hazel, poison oak, and grasses.

Distribution Extent: Eastern side of the Coast Range in Northern Douglas County and Southern Lane County, Oregon. The series is moderately extensive.

Series Proposed: Douglas County, Oregon, 1975. The name is from Bateman Ridge.

Remarks: Laboratory data shows the base saturation (sum of bases) is 50 percent at 72 inches. Bateman is labeled Unit 396 in the BLM soil survey.

Tentative Series
SRW-TSG-AON
11/75

DARBY SERIES (397)

The Darby series consists of deep, well drained soils that formed in colluvium weathered from basalt and sediments of the Umpqua Formation. Darby soils are on moderately steep mountainous hill slopes and have slopes of 10 to 40 percent. The annual precipitation is about 40 inches and the annual air temperature is about 54° F.

Taxonomic Class: Fine, mixed, mesic Pachic Ultic Argixerolls.

Typical Pedon: Darby silty clay loam, forested. (Colors are for moist soil unless otherwise noted.)

O1--1 to 0 inches; fern leaves, Douglas-fir needles, twigs.

A--0 to 5 inches; very dark brown (10 YR 2/2) silty clay loam, dark grayish brown (10 YR 4/2) dry; moderate fine subangular blocky structure; hard, friable, sticky, plastic; common very fine to medium roots; many irregular and few fine tubular pores; slightly acid (pH 6.4); clear wavy boundary. (4 to 8 inches thick).

B1--5 to 10 inches; very dark brown (10 YR 2/2) silty clay loam, very dark grayish brown (10 YR 4/2) dry; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common very fine to medium roots; many irregular and few fine tubular pores; slightly acid (pH 6.4); clear wavy boundary. (4 to 8 inches thick).

B21t--10 to 19 inches; very dark brown (10 YR 2/2) silty clay, dark yellowish brown (10 YR 3/4) dry; strong medium angular and subangular blocky structure; very hard, friable, very sticky and very plastic; common fine to medium roots; many very fine irregular and few fine tubular pores; few moderately thick clay films on ped faces; neutral (pH 6.8); clear wavy boundary. (8 to 15 inches thick).

B22t--19 to 30 inches; very dark brown (10 YR 2/2) silty clay, very dark grayish brown (10 YR 3/2) dry; strong medium angular and subangular blocky structure; extremely hard, firm, very sticky and very plastic; few fine and very fine roots; many very fine and fine irregular pores; many moderately thick clay films on ped faces; neutral (pH 6.8); clear wavy boundary. (10 to 30 inches thick).

B23t--30 to 44 inches; very dark brown (10 YR 2/2) silty clay, very dark grayish brown (10 YR 3/2) dry; dark yellowish brown (10 YR 3/4) dry crushed; strong angular blocky structure; very hard, firm, very sticky and very plsstic; common fine and medium roots; many very fine irregular pores; continuous thick clay skins on ped faces; 15 percent fine pebbles; neutral (pH 6.8). (5 to 15 inches thick).

B3t--44 to 60 inches; dark yellowish brown (10 YR 4/4) silty clay loam, yellowish brown (10 YR 5/4) dry; moderate medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; many very fine pores; few moderately thick clay films on faces of peds, 15 percent pebbles; neutral (pH 6.8).

Type Location: Douglas County, Oregon. The site is located on the 26.0 road about 200 feet West of its junction with the 26.1 road in the NE¼ SE¼, section 27, T. 25 S., R. 4 W.

Range in Characteristics: The mean annual soil temperature ranges from 52° to 57° F. Depth to bedrock commonly is 60 to 80 inches. Some pedons that are 40 to 60 inches deep to saprolite or bedrock are included. The hue ranges from 10 YR to 5 YR. The mollic epipedon ranges from 20 to 60 inches thick.

The A horizon has value of 2 or 3 moist, 3 or 4 dry and chroma of 1 or 2 moist or dry. The texture ranges from clay loam to silty clay.

The B2t horizon has value of 2 or 3 moist, 3 or 4 dry, and chroma of 1 or 2 moist or dry. The crushed dry chroma is one unit higher than uncrushed dry chroma. It is clay or silty clay with 40 to 50 percent clay commonly lacking rock fragments in the upper part but ranging from 5 to 15 percent in the lower part.

The C horizon where present ranges in texture from clay loam to loam.

Competing Series: These are the Coburg, Dixonville, Malabon and Silverton series. Coburg soils are moderately well drained soils on terraces and have mottles at depths of 20 to 36 inches. Dixonville soils have a paralithic contact at depths of 20 to 40 inches. Malabon soils are on terraces, deeper than 80 inches to bedrock, have dry chroma of 3 or 4 in the argillic horizon, and commonly stratified below 40 inches. Silverton soils are 25 to 40 inches deep to a lithic contact.

Geographic Setting: Darby soils are on ridgetops and sloping to steep sideslopes in hilly and steep uplands. Slopes commonly range from 10 to 40 percent. Elevations range from 400 to 2600 feet. The soils have formed in colluvium weathered from basalt of the Umpqua Formation. The climate is characterized by cool moist winters and dry warm summers with precipitation ranging from 30 to 40 inches. Mean January temperature is 39° F.; mean July temperature is 60° F.; the average annual temperature is 50° to 55° F. The frost-free season is about 160 to 210 days.

Geographically Associated Soils: These are the Bellpine, Nekia, Price, Philomath, Ritner, Witzel, and Yamhill soils. Bellpine and Nekia soils lack mollic epipedons and have low base saturation. Price and Ritner soils have ochric epipedons and lack argillic horizons. Philomath soils lack argillic horizons and are less than 20 inches to a paralithic contact. Witzel soils are less than 20 inches deep to bedrock and Yamhill soils lack argillic horizons and are 20 to 40 inches deep to bedrock.

Drainage and Permeability: Well drained; slow to rapid runoff; slow permeability.

Use and Vegetation: Pasture, hay, homesites, timber production, wildlife, and watershed. Native vegetation is Oregon white oak, black oak, Douglas-fir, grasses, and poison oak.

Distribution and Extent: Footslopes of the Coast Range and Cascade Mountains in Western Oregon. The series is of moderate extent.

Series Proposed: Douglas County, Oregon, 1975. The name is coined.

Remarks: Darby soils are labeled Unit 397 in the BLM soil survey.

Tentative Series
SRW-TSG
7/74

HOLDERMAN SERIES (400)

Soil Family: Loamy-skeletal, mixed Typic Cryochrepts.

Typical Pedon: Holderman very gravelly loam - forested. (Colors are for moist soil unless otherwise noted.)

A--0 to 5 inches; dark yellowish brown (10 YR 3/4) very gravelly heavy loam, brown (10 YR 5/3) dry; weak fine granular structure; loose, friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; many fine pores; 45 percent fine gravel; strongly acid (pH 5.4); clear wavy boundary. (3 to 10 inches thick).

B21--5 to 20 inches; dark yellowish brown (10 YR 3/4) very gravelly heavy loam, brown (10 YR 4/3) dry; weak fine granular structure; loose, friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; many fine pores; 60 percent fine gravel; strongly acid (pH 5.4); clear wavy boundary. (8 to 16 inches thick).

B22--20 to 32 inches; dark brown (10 YR 3/3) very gravelly heavy loam, dark yellowish brown (10 YR 4/4) dry; weak fine subangular blocky structure; loose, friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; common fine pores; 40 percent fine gravel and 30 percent cobbles; strongly acid (pH 5.2); abrupt smooth boundary. (8 to 20 inches thick).

C--32 inches; soft, highly weathered tuff.

Type Location: Douglas County, Oregon. The site is located 10.6 miles up the 26-3-34.2 road in the NE¼ SW¼, Sec. 26, T. 26 S., R. 2 W.

Tentative Series
SRW-TSG
7/74

WINBERRY SERIES (410)

Soil Family: Loamy-skeletal, mixed Dystric Lithic Cryochropts.

Typical Pedon: Winberry very gravelly loam - forested. (Colors are for most soil unless otherwise noted).

A--0 to 5 inches; very dark grayish brown (10 YR 3/2) very gravelly loam, brown (10 YR 5/3) dry; weak fine granular structure; slightly hard, friable, nonsticky, nonplastic; many fine, medium, and coarse roots; many fine and medium pores; 75 percent fine gravel; strongly acid (pH 5.4); clear wavy boundary. (3 to 8 inches thick).

B2--5 to 18 inches; dark brown (7.5 YR 4/4) very cobbly loam, yellowish brown (10 YR 5/4) dry; weak medium subangular blocky structure; slightly sticky, slightly plastic; many fine, medium, and coarse roots; many fine and medium pores; 30 percent coarse gravel and 45 percent cobbles; strongly acid (pH 5.4); diffuse irregular boundary. (8 to 16 inches thick).

R--18 inches; slightly fractured tuff.

Type Location: Douglas County, Oregon. The site is located 11.1 miles up the 26-3-34.2 road in the SE¼ SE¼, Sec. 26, T. 26 S., R. 2 W.

Tentative Series
SRW-TSG
7/74

UMPCOOS SERIES (564)

Soil Family: Loamy-skeletal, mixed, mesic Lithic Dystrochrepts.

Typical Pedon: Umpcoos gravelly loam - forested. (Colors are for moist soil unless otherwise noted.)

O1--½ to 0 inches; mostly Douglas-fir needles.

A--0 to 3 inches; dark brown (10 YR 4/3) gravelly loam, light brownish gray (10 YR 6/2) dry; moderate medium granular structure; soft, very friable, nonsticky, nonplastic; few fine roots; many fine roots; many very fine pores; 20 percent fine gravel; medium acid (pH 5.6); abrupt smooth boundary. (2 to 8 inches thick).

B--3 to 18 inches; dark brown (0 YR 4/3) very gravelly silt loam; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; many medium and many coarse roots; many fine and many medium pores; 50 percent hard sandstone rock fragments 2 inches or less; medium acid (pH 6.0); abrupt wavy boundary. (10 to 16 inches thick).

R--18 inches; hard sandstone.

Type Location: Douglas County, Oregon. The site is approximately 100 feet below 21-7-14.2 road on the west side near a large debris slide in the NW¼ NW¼, sec. 14, T. 21 S., R. 7 W.

Established Series
Rev. SRW-TSG
7/74

SISKIYOU SERIES (721)

Soil Family: Coarse-loamy, mixed, mesic Typic Xerochrepts.

Typical Pedon: Siskiyou fine sand loam - forested. (Colors are for moist soil unless otherwise noted).

O1--1 to 0 inches; partially decomposed hazel, willow, and hairy honeysuckle leaves, and Douglas-fir needles.

A1--0 to 9 inches; dark brown (10 YR 4/3) fine sandy loam, light brownish gray (10 YR 6/2) dry; weak fine granular structure; soft, very friable, nonsticky, nonplastic, many fine, medium, and coarse roots; medium acid (pH 5.8); clear wavy boundary. (4 to 12 inches thick).

B--9 to 31 inches; yellowish brown (10 YR 5/4) coarse sandy loam, very pale brown (10 YR 7/3) dry; weak medium subangular blocky breaking to moderate medium granular structure; slightly hard, friable, nonsticky, nonplastic; common fine, medium, and coarse roots; many fine and medium pores; medium acid (pH 6.0); clear irregular boundary. (10 to 30 inches thick).

C--31 inches; moderately hard, highly weathered, highly fractured, decomposed granite.

Type Location: Douglas County, Oregon. The site is located on the 31-3-3.1 road about 1,300 feet from its junction with the 31-3-11.0 road in the SW¼ SW¼, Sec. 12, T. 31 S., R. 3 W.

Established Series
SRW-TSG
7/74

HOLLAND SERIES (722)

Soil Family: Fine-loamy, mixed, mesic Ultic Haploxeralfs.

Typical Pedon: Holland loam - forested. (Colors are for moist soil unless otherwise noted.)

O2--1/2 to 0 inches; Douglas-fir needles, small leaves.

A1--0 to 4 inches; dark brown (7.5 YR 4/4) loam, light yellowish brown (10 YR 6/4) dry; moderate medium granular structure; loose, friable, slightly sticky, slightly plastic; many fine and medium roots; few fine pores; medium acid (pH 6.0); clear wavy boundary. (3 to 10 inches thick).

A3--4 to 12 inches; dark brown (7.5 YR 4/4) loam, light yellowish brown (10 YR 6/4) dry; weak fine granular structure; loose, friable, slightly sticky, slightly plastic; many fine and medium roots; many fine and medium pores; medium acid (pH 5.6); clear wavy boundary. (4 to 14 inches thick).

B21t--12 to 36 inches; strong brown (7.5 YR 5/6) gravelly clay loam, reddish yellow (7.5 YR 6/6) dry; weak medium subangular blocky structure; loose, friable, sticky, plastic; many fine roots, many fine and medium pores; common thin clay films; 30 percent fine gravel; medium acid (pH 5.6); clear smooth boundary. (10 to 30 inches thick).

B22t--36 to 62 inches; dark brown (7.5 YR 4/4) heavy sandy clay loam, reddish yellow (7.5 YR 6/6) dry; moderate medium subangular blocky structure; hard, very firm, sticky, plastic; common fine and medium pores; thin continuous clay films; medium acid (pH 5.6); clear irregular boundary. (15 to 30 inches thick).

Cr--62 inches; highly weathered, highly fractured decomposed granite, with thick red clay films on fracture faces.

Type Location: Douglas County, Oregon. The site is located 3.1 miles up the 29-4-20.0 road in the NE ¼ NE ¼, Sec. 19, T. 29 S. R. 4 W.

Tentative Series
SRW-TSG
7/74

BARRON SERIES (723)

Soil Family: Coarse - loamy, mixed, mesic Typic Xerochrepts.

Typical Pedon: Barron gravelly loam - forested. (Colors are for moist soil unless otherwise noted).

O2--2 to 0 inches; decomposed organic material.

A1--0 to 10 inches; dark grayish brown (10 YR 4/2) gravelly loam, light brownish gray (10 YR 6/2) dry; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many fine and medium roots; 25 percent fine gravel; neutral (pH 6.8) abrupt smooth boundary. (4 to 12 inches thick).

A3--10 to 16 inches; dark brown (10 YR 4/3) gravelly loam, pale brown (10 YR 6/3) dry; weak fine granular structure; soft, very friable, nonsticky, nonplastic; many fine and coarse roots; 20 percent fine gravel; very strongly acid (pH 5.0); abrupt smooth boundary. (4 to 10 inches thick).

B2--16 to 40 inches; yellowish brown (10 YR 5/4) coarse sandy loam, very pale brown (10 YR 7/3) dry; weak medium subangular blocky structure; soft, very friable, nonsticky, nonplastic; few coarse roots; many fine pores; strongly acid (pH 5.4); clear wavy boundary. (16 to 30 inches thick).

B3--40 to 57 inches; light yellowish brown (10 YR 6/4) coarse sandy loam, very pale brown (10 YR 7/4) dry; very weak subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine roots; many fine pores; strongly acid (pH 5.2); clear irregular boundary. (5 to 20 inches thick).

CR--57 to 65 inches; highly weathered, highly fractured, decomposed granite, (pH 6.0).

Type Location: Douglas County, Oregon. The site is located on a road cut-bank along the 31-3-2.2 road approximately 1,500 feet from the junction of the 31-3-2.2 and 31-3-1.1 roads in the SE¼ SW¼, Sec. 1, T. 31 S., R. 3 W.

Tentative Series
SRW-TSG-AON
11/75

LETTIA SERIES (724)

The Lettia series consists of deep well drained soils that formed in colluvium weathered from granite. Lettia soils are on gently sloping to steep slopes in mountainous areas and have slopes of 0 to 40 percent. The annual precipitation is about 40 inches and annual air temperature is about 54° F.

Taxonomic Class: Fine, mixed, mesic Ultic Haploxeralfs

Typical Pedon: Lettia loam, forested. (Colors are for moist soil unless otherwise noted).

O2--1/2 to 0 inches; dark decomposed organic material.

A1--0 to 5 inches; dark brown (10 YR 3/3) loam, brown (10 YR 5/3) dry; medium fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine to medium roots; 15 percent pebbles; medium acid (pH 6.0); abrupt smooth boundary. (4 to 8 inches thick).

A3--5 to 12 inches; dark brown (7.5 YR 4/4) sandy clay loam, light yellowish brown (10 YR 6/4) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine to coarse roots; many very fine pores; 15 percent pebbles; neutral (pH 6.6); clear smooth boundary. (6 to 10 inches thick).

B1--12 to 16 inches; yellowish red (5 YR 4/6) light clay loam, light brown (7.5 YR 6/4) dry; strong medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; many very fine to coarse roots; many very fine to medium pores; few medium distinct pink (5 YR 7/3) cutans; 10 percent pebbles; medium acid (pH 5.8); clear smooth boundary. (4 to 6 inches thick).

B21t--16 to 26 inches; yellowish red (5 YR 4/6) gravelly clay loam, yellowish red (5 YR 5/6) dry; strong medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine to medium roots; common very fine to medium pores; common thin (5 YR 4/4) clay films; common medium distinct pink (5 YR 7/3) cutans; 15 percent pebbles; medium acid (pH 6.0); gradual wavy boundary. 10 to 15 inches thick).

B22t--26 to 36 inches; yellowish red (5 YR 5/6) gravelly clay, reddish yellow (5 YR 6/6) dry; strong medium subangular blocky structure; extremely hard, firm, sticky and very plastic; very few fine roots; many very fine pores; many thin (5 YR 4/6) clay films; 5 percent pebbles; strongly acid (pH 5.4); diffuse wavy boundary. (14 to 25 inches).

B23t--36 to 54 inches; yellowish red (5 YR 5/6) gravelly clay, reddish yellow (5 YR 6/6) dry; strong medium angular blocky structure; extremely hard, firm, sticky, very plastic; few medium pores; moderately thick continuous (5 YR 4/6) clay films; 5 percent fine gravel; strongly acid (pH 5.4); diffuse wavy boundary.

B31t--54 to 68 inches; yellowish red (5 YR 5/8) clay loam; moderate coarse subangular blocky structure; extremely hard, friable, slightly sticky, plastic; few fine pores; many thin (5 YR 5/6) clay films; 5 percent pebbles; medium acid (pH 5.6); diffuse wavy boundary. (12 to 18 inches).

B32t--68 to 81 inches; yellowish red (5 YR 5/8) clay loam; moderate medium subangular blocky structure; hard friable, slightly sticky plastic; few very fine pores; common thin (5 YR 4/6) clay films; 5 percent pebbles; strongly acid (pH 5.4). (12 to 15 inches).

Type Location: Douglas County, Oregon. The site is located about 1600 feet from the junction of 28-4-27 and North Myrtle Creek roads on the 28-4-27 road in the SW¼ NW¼, Section 27, T. 28 S., R. 4 W.

Range in Characteristics: The mean annual soil temperature is 52° to 56° F. The soils are usually moist but dry for 60 to 80 days during the 120 day period following the summer solstice. The depth to hard bedrock is greater th n 20 feet.

The A horizon has hue of 7.5 YR and 10 YR, value of 3 to 5 moist, 5 to 7 dry and chroma of 3 or 4 moist or dry. It is loam, sandy clay loam or clay loam.

The B horizon has hue of 5 YR and 7.5 YR, value of 5 or 6 moist, 6 or 7 dry and chroma of 5 through 8 moist or dry. Texture ranges from clay to clay loam with 5 to 25 percent pebbles and 35 to 50 percent clay and 25 percent medium and coarser sands.

The C horizon where present ranges in texture from sandy clay loam to sandy loam.

Competing Series: These are the Freezener, Jumpoff, Manzanita, Napavine, Oak Grove, Oakland, Salkum, Secata and Veneta series. Freezener soils are strongly to very strongly acid in the lower B horizons, have mean annual soil temperature of 47° to 52° F.,

have less than 7 percent medium and coarser sands and have formed in weathered basic igneous rocks. Jumpoff soils have hue yellower than 7.5 YR, depth to partially weathered tuff or volcanic breccia is 40 to 60 inches, and have less than 15 percent medium and coarser sands. Manzanita soils are dry for more than 90 consecutive days during the summer and fall months, and have distinct high chroma mottles in the Bt horizon. Nabavine soils have umbric epipedons and have less than 5 percent medium and coarser sands. Oak Grove soils have umbric epipedons, have less than 10 percent medium and coarser sands, and have formed in alluvium and mud flows weathered from basic igneous rocks. Oakland soils are 20 to 40 inches deep to a paralithic contact and weathered sandstone. Salkum soils have umbric epipedons and have less than 5 percent medium and coarser sands, and have highly variegated and mottled lower argillic and C horizons. Secata soils have value of 3 moist and 5 dry to depth of 10 inches or more, have slightly acid to mildly alkaline B2t horizons with reaction increasing with depth, have less than 15 percent medium and coarser sands, and have formed in weathered metabasic, basic and ultrabasic volcanic rock. Veneta soils have more than 60 percent clay in the lower Bt and C horizons and have less than 5 percent medium and coarser sands.

Geographic Setting: Lettia soils are on sidehills, old slump benches and broad ridgetops at elevations of 500 to 2500 feet. Slopes range from 0 to 40 percent. The soils formed in colluvium weathered from granite. The winters are cool and moist and the summers are warm and dry. Mean annual temperature is 50° to 54° F; the mean July temperature is 67° F.; and the mean January temperature is 40° F. The frost-free season is 120 to 200 days.

Geographically Associated Soils: These are Abegg, Holland, Pollard and Siskiyou series. Abegg soils are loamy-skeletal. Holland soils are fine-loamy. Pollard soils have base saturation of less than 35 percent. Siskiyou soils are coarse-loamy and lack argillic horizons.

Drainage and Permeability: Well drained; slow to rapid runoff; moderately slow permeability; slow to rapid runoff.

Use and Vegetation: Timber production, grazing, homesites, wildlife, and watershed. Native vegetation is Douglas-fir, incense cedar, madrone, oceanspray, poison oak, some salal, and grasses.

Distribution and Extent: Northern parts of the Klamath Mountains. The series is minor in extent.

Series Proposed: Douglas County, Oregon, 1975. The name is from Lettia Creek.

Remarks: Lettia soils are labeled Unit 724 in the BLM soil survey. Characterization data (574-OR-10-2) from Oregon State University is shown in Table 12.

Tentative Series
SRW-TSG
6/74

VENA SERIES (731)

Soil Family: Loamy-skeletal, mixed, mesic Dystric Xerochrepts.

Typical Pedon: Vena gravelly loam - forested. (Colors are for moist soil unless otherwise noted).

O1--1 to 0 inches; partially decomposed Douglas-fir needles, bark, cones and incense cedar needles.

A1--0 to 4 inches; dark reddish brown (5 YR 3/2) very gravelly loam, dark reddish gray (5 YR 4/2) dry; moderate fine granular structure; loose, friable, nonsticky, nonplastic; many fine and medium roots, many fine pores; 70 percent fine gravel; strongly acid (pH 5.2); abrupt wavy boundary. (2 to 9 inches thick).

B2--4 to 22 inches; reddish brown (5 YR 4/3) very gravelly heavy loam, light gray (5 YR 7/1) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky, slightly plastic; common fine and coarse roots; many fine and medium pores; 35 percent coarse and 10 percent fine gravel; medium acid (pH 5.6) gradual wavy boundary. (10 to 20 inches thick).

B3--22 to 28 inches; reddish brown (5 YR 4/4) very gravelly loam; weak medium subangular blocky structure; slightly hard, friable, nonsticky, nonplastic; few fine roots; many fine and medium pores; 40 percent fine gravel; medium acid (pH 5.6); abrupt wavy boundary. (0 to 10 inches thick).

R--28 inches; moderately hard, slightly fractured tuff.

Type Location: Douglas County, Oregon. The site is approximately 50 yards from the junction of the 30-2-3.0 and 30-2-3.2 roads in the SW¼ SE¼, Sec. 3, T. 30 S., R. 2 W.

Tentative Series
SRW-AON
12/75

SHIPPA SERIES (732)

The Shippa series consists of shallow, well drained soils that formed in colluvium weathered from volcanic rocks. Shippa soils are on very steep sideslopes in mountainous areas and have slopes of 50 to 100 percent. The annual precipitation is about 45 inches and the annual air temperature is about 48° F.

Taxonomic Class: Loamy-skeletal, mixed, mesic Dystric Lithic Xerochrepts.

Typical Pedon: Shippa very gravelly loam, forested. (Colors are for moist soil unless otherwise noted.)

A1--0 to 4 inches; dark brown (7.5 YR 3/2) very gravelly loam, pinkish gray (7.5 YR 6/2) dry; moderate fine granular structure; soft, very friable, nonsticky and nonplastic: many very fine to coarse roots; many very fine irregular pores; 50 percent pebbles and 15 percent cobbles; slightly acid (pH 6.4); clear smooth boundary. (3 to 9 inches thick).

B2--4 to 16 inches; brown (7.5 YR 4/4) very cobbly loam, light brown (7.5 YR 6/4) dry; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine to coarse roots; many very fine tubular pores; 20 percent pebbles and 50 percent cobbles; medium acid (pH 6.0); abrupt wavy boundary. (7 to 13 inches thick).

R--16 inches; hard, fractured andesite with roots and soil material in some cracks in the upper few inches.

Type Location: Jackson County, Oregon; NW¼ SW¼ NE¼, Section 23, T. 32 S., R. 1 W., Willamette Meridian.

Range in Characteristics: Mean annual soil temperature ranges from 47° to 52° F. The soils are usually moist but dry in the control section for 60 to 80 consecutive days during the summer. The soils are moist during the winter months. Depth to bedrock ranges from 12 to 20 inches. The texture commonly is gravelly loam throughout, but in some pedons the B horizon is clay loam. Rock fragments range from 20 to 50 percent pebbles and 15 to 50 percent cobbles.

The A horizon has value of 3 or 4 moist, 6 or 7 dry, and chroma of 2 or 3 moist and dry.

The B horizon has value of 6 or 7 dry and chroma of 3 or 4 moist and dry. It has moderate fine and medium subangular blocky or weak to moderate granular structure.

Competing Series: These are the Deadwood, Goulding, Larmine, Marpleen, Slab, and Vermisa series. Deadwood soils dominantly are moderately coarse textured and have less than 18 percent clay. Goulding soils have more than 60 percent base saturation in all or in some part of the control section. Larmine soils have greater than 60 percent base saturation in some part of the solum, less than 18 percent clay in the B horizon, and overlie sandstone bedrock. Marpleen soils have intermittent A2 and Bir horizons. Vermisa soils have greater than 60 percent base saturation in some part of the solum.

Geographical Setting: The Shippa soils have steep to very steep slopes in mountainous areas of the Western Cascades at elevations of 2,000 to 4,000 feet; slope gradients dominantly are 50 to 30 percent but

range from 35 to over 90 percent. The soils formed in colluvium weathered from igneous rocks, dominantly andesite, tuffs and breccia. The climate is subhumid with cool, wet winters and hot, dry summers. The mean annual precipitation is 35 to 55 inches. The mean annual temperature is about 45° to 50° F.; the mean January temperature centers on 35° F.; and the mean July temperature centers on 68° F. The frost-free period ranges from 100 to 150 days.

Geographically Associated Soils: These are the Chamate, Freezener, Straight, and Vena series. Chamate soils are deep soils. Freezener soils have fine-textured argillic horizons. Straight soils have 7.5 YR and 5 YR hues and are 20 to 40 inches deep to reddish breccia. Vena soils are 20 to 40 inches deep to bedrock.

Drainage and Permeability: Well drained; very rapid runoff; moderately rapid permeability.

Use and Vegetation: Water supply, wildlife and timber production. Present vegetation mainly is ponderosa pine, madrone, incense-cedar Douglas-fir and an understory of chinquapin, oceanspray, serviceberry, and blackberry.

Distribution and Extent: The westside of the Southern Cascade Mountains, Oregon. The series is of moderate extent.

Series Proposed: Jackson County (Medford district, BLM), Oregon, 1975.

Remarks: Shippa soils are labeled Unit 732 in the BLM soil survey.

Tentative Series
Rev SRW-TSG
7/74

FREEZENER SERIES (741)

Soil Family: Fine, mixed, mesic Ultic Haploxeralfs.

Typical Pedon: Freezener heavy loam - forested. (Colors are for moist soil unless otherwise noted).

O1--3 to 0 inches; partially decomposed Douglas-fir needles and cones, salal leaves, and fine roots.

A1--0 to 6 inches; dark reddish brown (5 YR 3/2) heavy loam, reddish brown (5 YR 4/3) dry; strong medium granular structure; slightly hard friable, slightly sticky, slightly plastic; many fine and medium roots; many fine and very fine pores; strongly acid (pH 5.4); clear smooth boundary. (4 to 9 inches thick).

B1--6 to 13 inches; reddish brown (5 YR 4/3) clay, reddish brown (5 YR 5/3) dry; strong fine subangular and angular blocky structure; hard, firm, sticky, plastic; many medium and common coarse roots; few fine and very fine pores; strongly acid (pH 5.4); clear smooth boundary. (5 to 15 inches thick).

B21t--13 to 23 inches; yellowish red (5 YR 4/7) clay, yellowish red (5 YR 4/6) dry; strong medium angular blocky structure; very hard, firm, sticky, plastic; common fine roots; common fine pores; many thin, yellowish red clay films; strongly acid (pH 5.4); clear wavy boundary. (6 to 16 inches thick).

B22t--23 to 34 inches; yellowish red (5 YR 4/8) clay, yellowish red (5 YR 4/6) dry; moderate medium subangular blocky structure; very hard, firm, very sticky, very plastic; few fine roots; few fine pores; moderately thick patchy 10 YR 3/4 clay films; 5 percent stones; very strongly acid (pH 5.0); gradual wavy boundary.

B23t--34 to 44 inches; strong brown (7.5 YR 5/8) clay; moderate coarse subangular blocky structure; friable, sticky, plastic; very few fine roots; very few fine pores; thin continuous 5 YR 4/6 clay films; very strongly acid (pH 5.0); gradual wavy boundary.

B3--44 to 56 inches; reddish yellow (7.5 YR 6/8) clay loam; weak coarse subangular blocky structure; very friable, sticky, plastic; few medium roots; common fine pores; thin patchy 5 YR 5/6 clay films; very strongly acid (pH 5.0); clear wavy boundary.

C--56 to 67 inches; very highly weathered, soft variegated tuff; yellowish red and pinkish white (5 YR 5/8.8/2) light clay loam; massive; firm, slightly sticky, slightly plastic; very few fine roots; very few fine pores; very strongly acid (pH 5.0).

Type Location: Douglas County, Oregon. The site is located on the 29-2-4/1 road about 75 yards from North line of Section 22 in the SW¼ SE¼, Sec. 15, T. 29 S., R. 2 W.

Proposed Series
Rev. SRW-TSG
7/74

SELMAC SERIES (743)

Taxonomic Class: Fine-loamy over clayey, mixed, mesic Ultic Haploxeralfs.

Typifying Pedon: Unit 743 loam - forested. (Colors are for moist soil unless otherwise noted).

A1--0 to 6 inches; brown (10 YR 4/3) loam, light brown (7.5 YR 6/5) dry; moderate fine granular structure; loose, friable, slightly sticky, slightly plastic; many fine and medium roots; many fine and medium interstitial pores; neutral (pH 6.8); clear smooth boundary. (3 to 10 inches thick).

A3--6 to 11 inches; Dark yellowish brown (10 YR 4/4) sandy loam, light brown (7.5 YR 6/4) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine, medium and coarse roots; many fine and medium interstitial pores; strongly acid (pH 5.2); clear smooth boundary. (4 to 12 inches thick).

B1--11 to 16 inches; Dark yellowish brown (10 YR 4/4) sandy clay loam, pink (7.5 YR 7/4) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky, slightly plastic; many fine and common medium roots; many fine and medium tubular pores; strongly acid (pH 5.2); abrupt smooth boundary. (4 to 10 inches thick).

B21t--16 to 24 inches; strong brown (7.5 YR 5/6) sandy clay loam, pink (7.5 YR 7/4) dry; weak meidum subangular blocky breaking to weak fine granular structure; hard, friable, sticky, plastic; few fine roots; few fine tubular pores; few thin clay skins on ped faces; strongly acid (pH 5.2); clear wavy boundary. (6 to 21 inches thick).

B22t--24 to 31 inches; strong brown (7.5 YR 5/8) clay loam, pink (7.5 YR 7/4) dry; strong medium subangular blocky structure; yellowish red (5 YR 5/6) iron mottles; hard, very firm, sticky, plastic; few fine roots; few moderately thick clay skins on ped faces; very strongly acid (pH 5.0); abrupt wavy boundary. (5 to 12 inches thick).

IIB23t--31 to 45+ inches; strong brown (7.5 YR 4/4) clay with many fine and medium distinct gray (5 YR 5/1) and pinkish gray (5 YR 7/2) mottles, brown (10 YR 7/4) dry; moderate medium subangular blocky structure; very hard, firm, very sticky, very plastic; few fine roots; continuous thick clay skins on ped faces; very strongly acid (pH 5.0).

Type Location: Douglas County, Oregon. The site is located 0.1 mile up short spur road off 28-3-33.0 road in the SE¼ SE¼, Sec. 28, T. 28 S., R. 3 W.

Series Proposed: Josephine County, Oregon, 1972. The name is taken from Selmac Lake.

Remarks: Selmac soils are labeled Unit 743 in the BLM soil survey.

Established Series
SRW-TSG
7/74

PEARSOLL SERIES (770)

Soil Family: Clayey - skeletal, serpentinitic, mesic Lithic Xerochrepts.

Typical Pedon: Pearsoll gravelly light clay loam. (Colors are for moist soil unless otherwise noted).

A1--0 to 5 inches; dark reddish brown (5 YR 3/3) gravelly light clay loam, reddish brown (5 YR 4/4) dry; moderate fine granular structure; loose, very friable, slightly sticky, slightly plastic; many fine and medium roots; common fine and medium pores; 25 percent gravel; neutral (pH 6.8); clear wavy boundary (2 to 9 inches thick).

B2--5 to 16 inches; dark reddish brown (5 YR 3/3) very gravelly clay dark reddish brown (5 YR 3/4) dry; moderate medium subangular blocky structure; slightly hard, friable, sticky, plastic; many fine and medium and coarse roots; common fine and medium pores; 20 percent coarse gravel and 20 percent cobbles; neutral (pH 7.0); abrupt irregular boundary. (4 to 16 inches thick).

R--16 inches; hard slightly fractured serpentine.

Type Location: Douglas County, Oregon. The site is located along an access road built by Hanna Nickle Company in the NE/SE, Sec. 17, T. 30 S., R. 6 W.

Tentative Series
SRW-TSG
7/74

CORNUTT SERIES (771)

Soil Family: Fine, serpentinitic, mesic Ultic Haploxeralfs.

Typical Pedon: Cornutt gravelly clay loam - forested. (Colors are for moist soil unless otherwise noted.)

O1--1 to 0 inches; many fine roots, pine needles, bark, dead grass.

A1--0 to 3 inches; dark reddish brown (2.5 YR 3/4) gravelly clay loam, reddish brown (5 YR 5/4) dry; strong fine granular structure; loose, friable, slightly sticky, slightly plastic; many fine, medium, coarse roots; many fine and medium pores; 20 percent gravel; neutral (pH 6.8); clear smooth boundary. (2 to 9 inches thick).

B1--3 to 8 inches; dark reddish brown (2.5 YR 3/4) gravelly clay, reddish brown (5 YR 5/4) dry; moderate medium subangular blocky structure; slightly hard, friable, sticky, plastic; many fine, medium, and coarse roots; common fine pores; 30 percent gravel; neutral (pH 7.2); clear smooth boundary. (4 to 10 inches thick).

B2t--8 to 25 inches; dark red (2.5 YR 3/6) gravelly clay, yellowish red (5 YR 4/6) dry; moderate fine and medium subangular blocky structure; slightly hard, firm, very sticky very plastic; many fine, medium, and coarse roots; common fine and medium pores; thin continuous clay films; 30 percent gravel; neutral (pH 7.0); abrupt irregular boundary. (10 to 20 inches thick).

C--25 to 60 inches; soft, highly weathered, highly fractured serpentine, (pH 8.2).

Type Location: Douglas County, Oregon. The site is located approximately 1,500 feet from the junction of 28-4-15.0 and 28-4-15.1 roads on the 28-4-15.0 road in the SE¼ NE¼, Sec. 15, T. 28 S., R. 4 W.

Proposed Series
SRW-TSG
8/75

JAYAR SERIES (824)

Jayar series consists of moderately deep, well drained soils that are forming in colluvium from metasedimentary, metavolcanic, and sedimentary rocks. Jayar soils are on moderately steep to steep mountainous topography and have slopes of 5 to 60 percent. The annual precipitation is 30 to 50 inches and annual air temperature is 42° to 44° F.

Taxonomic Class: Loamy-skeletal over fragmental, mixed, frigid Dystric Xerochrept.

Typical Pedon: 824 very gravelly loam - forested. (Colors are for moist soil unless otherwise noted).

O1--1 to 1/2 inch; Douglas-fir needles, bark, lichen, ocean spray leaves.

O2--1/2 to 0 inch; black decomposed organic matter.

A1--0 to 5 inches; Very dark grayish brown (10 YR 3/2) very gravelly loam, brown (10 YR 6/3) dry; moderate fine granular structure; soft, friable, nonstocky, nonplastic; many fine, medium, and coarse roots; many fine and medium pores; 40 percent fine gravel; medium acid (pH 5.6); abrupt smooth boundary. (2 to 9 inches thick).

A3--5 to 10 inches; dark brown (10 YR 3/3) loam, light brown (7.5 YR 6/4) dry; moderate medium granular structure; hard, friable, slightly sticky, slightly plastic; many fine, medium, and coarse roots; many fine and medium pores; 15 percent fine gravel; medium acid (pH 5.8); clear smooth boundary. (2 to 10 inches thick).

B2--10 to 24 inches; dark brown (7.5 YR 4/4) gravelly clay loam, light brown (7.5 YR 6/4) dry; moderate medium subangular blocky structure; hard, friable, slightly sticky, plastic; common fine and medium roots; many fine, medium, and coarse pores; 35 percent gravel; medium acid (pH 5.8); gradual wavy boundary. (8 to 20 inches thick).

B3--24 to 36 inches; dark brown (7.5 YR 4/4) very gravelly clay loam, light brown (7.5 YR 6/4) dry; weak medium subangular blocky structure; hard, friable, slightly sticky, plastic; few fine roots; many fine and medium pores; 50 percent gravel; strongly acid (pH 5.4); gradual irregular boundary. (0 to 16 inches thick).

C--36 inches +; moderately hard, highly fractured, sandstone.

Type Location: Douglas County, Oregon. The site is located 315 feet North of the junction of 31-8-3 and 31-8-8.1 roads on the 31-8-3.0 road in the NW½ NW¼, Sec. 16, T. 31 S., R. 8 W.

Range in Characteristics: The soils are usually moist but, in most years, they are dry between 4 and 12 inches for more than 45 consecutive days during the summer months. The mean annual soil temperature ranges from 44° to 46° F. Solum thickness ranges from 20 to 40 inches. Coarse fragments range from 35 to 50 percent throughout the solum with an accumulation of gravel-sized fragments in the surface 5 or 6 inches. The A horizon has hue of 10 YR or 7.5 YR, value of 3 to 4 moist and 5 or 6 dry, and chroma of 2 to 4 moist and dry. Texture is gravelly loam. The B horizon has hue of 7.5 YR or 10 YR, value of 3 to 5 moist and 5 to 7 dry, and chroma of 3 to 6 moist and dry. Texture is gravelly clay loam or very cobbly clay loam.

Competing Series and Their Differentiae: These are the Trask, Straight, Coyata and Boze series. The Trask, Straight and Coyata soils have mesic temperature regimes. The Boze soils have fewer than 35 percent coarse fragments in the control section.

Setting: The 824 soils occur on steep to very steep hills at elevations of 3,500 to 5,000 feet. Slope gradients range from 35 to 75 percent. The regolith consists of moderately fine textured gravelly colluvium from metamorphic, volcanic and sedimentary rocks. The climate is characterized by cool, dry summers and cold, moist winters, with an annual precipitation of 30 to 50 inches. The mean annual air temperature is about 46° to 48° F.

Principal Associated Series: These include the Skymor series. The Skymor series is less than 20 inches deep.

Drainage and Permeability: Well drained; medium to rapid run-off; moderate permeability.

Use and Vegetation: Timber production, water supply and wildlife. The native vegetation includes white fir, Douglas-fir, madrone, snowbrush, Oregon grape and grasses.

Distribution and Extent: Southwestern Oregon and Northern California. The series is of moderate extent.

Series Proposed: Douglas County, Oregon, 1975. The name is coined.

Remarks: Jayar soils are labeled Unit 824 in the BLM Soil Survey.

Tentative Series
SRW-TSG-AON
12/75

SKYMOR SERIES (825)

The Skymor series consists of shallow, well drained soils that formed in colluvium weathered from metasedimentary, metavolcanic, and sedimentary rocks. Skymor soils are on steep to very steep slopes in mountainous areas and have slopes of 35 to 90 percent. The annual precipitation is about 40 inches and annual air temperature is about 43° F.

Taxonomic Class: Loamy-skeletal, mixed, frigid Lithic Dystric Xerochrepts.

Typical Pedon: Skymor very gravelly loam, forested. (Colors are for moist soil unless otherwise noted).

O1--1 to 0 inches; partially decomposed Douglas-fir needles and bark, lichen, oceanspray leaves.

A1--0 to 5 inches; very dark brown (10 YR 2/2) very gravelly loam, gray brown (10 YR 5/2) dry; moderate medium granular structure; slightly hard, friable, nonsticky and nonplastic; many very fine to medium roots; many very fine pores; 50 percent pebbles; medium acid (pH 5.6); clear wavy boundary. (3 to 6 inches thick).

B2--5 to 14 inches; dark brown (10 YR 3/3) very gravelly clay loam, pale brown (10 YR 6/3) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine to few coarse roots; common very fine and fine pores; 55 percent pebbles; medium acid (pH 5.8); gradual wavy boundary. (8 to 14 inches thick).

R--14 inches; hard, highly fractured fine sandstone.

Type Location: Douglas County, Oregon. The site is located on the 31-8-3.0 road about 300 feet North of the junction of 31-8-8.1 and 31-8-3 roads in the NW¼ NW¼, Section 16, T. 31 S., R. 8 W.

Range in Characteristics: The mean annual soil temperature ranges from 42° to 47° F. The soils are usually moist but are dry in all parts for more than 45 consecutive days during the summer months. Depth to a lithic contact is 12 to 20 inches. Changes in depth occur erratically over a span of a few feet. Rock fragments make up 35 to 60 percent of the profile.

The A horizon has hue of 10 YR or 7.5 YR, value of 3 through 5 moist and 5 or 6 dry, and chroma of 2 through 4 moist and 3 or 4 dry.

The B horizon has hue of 10 YR or 7.5 YR, value of 4 or 5 moist and 6 or 7 dry, and chroma of 3 through 5 moist and 4 through 6 dry. It is clay loam or loam with 35 to 60 percent rock fragments and 18 to 30 percent clay.

Competing Series: These are the Jayar, Yellowstone, and Yollabolly series. Jayar soils are 20 to 40 inches deep to bedrock. Yellowstone soils have umbric epipedons and cryic soil temperatures. Yollabolly soils lack cambic horizons.

Geographic Setting: The Skymor soils are on steep to very steep slopes in mountainous areas at elevations of 3,500 to 6,000 feet. Slope gradients range from 35 to 90 percent. The soils formed in medium textured gravelly colluvium weathered from metamorphic and sedimentary rocks. The climate is characterized by cool, dry summers and cold, moist winters, with an annual precipitation of 30 to 50 inches. The mean annual temperature is about 40° to 45° F., and the frost-free season is less than 110 days.

Geographically Associated Soils: This is the competing Jayar series.

Drainage and Permeability: Well drained; medium to very rapid run-off; moderate permeability.

Use and Vegetation: Timber production, water supply and wildlife. The native vegetation includes white fir, ponderosa pine, Douglas-fir, live oak, rhododendron, salal, princess pine and grasses.

Distribution and Extent: Southwestern Oregon. The series is of minor extent.

Series Proposed: Douglas County, Oregon, 1975. The name is coined.

Remarks: Skymor soils are labeled Unit 825 in the BLM Soil Survey.

APPENDIX

APPENDIX # 1 - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index Age	Height	S.I.$_{50}$	S.I.$_{100}$	Remarks
Blachly (10)	NE/NW Sec. 36, T25S, R1W, 25½-1E-32.0 Rd.	2,600'	south	mid-slope 50%	50	110	110 III	138	
					51	130	128 II	163	
					55	120	114 III	143	
					50	120	120 II	152	
					52	120	118 III	149	
							118	149	
Blachly (10)	S½/NE¼, Sec. 17, T25S, R2W, Shoup Ck.	2,300'	N/E	upper 20%	25	8	130	166	
					26	9	120	152	
					25	9	118	149	
					25	9	118	149	
					25	10	106	133	
					25	9	118	149	
							118	149	
Honeygrove (14t)	SW/SW, Sec. 20, T27S, R2W, 14.1 Road, Sampson Butte Area	2,400'	west	Nearly flat, gentle ground	107	130	93	115	
					75	121	100	125	
					77	125	104	130	
					75	133	108	135	
					72	120	104	130	
							101	127	
			north	Nearly flat, gentle ground	69	110	93	115	
					67	91	90	110	
					66	93	91	112	
							91	112	
Honeygrove(14t)	NE/NE, Sec. 27, T 25 S, R 2 W	2,400'	north	15%	9	23	104	130	
					13	32	103	129	
					8	22	114	143	
					9	25	114	143	
					10	25	102	128	
					11	30	114	143	
							106	132	
Honeygrove(14t)	SW/NE, Sec. 27 T 25 S, R 2 W	2,300'	north	15%	8	20	106	133	
					9	26	116	146	
					9	23	104	130	
					9	24	108	135	
					10	25	102	128	
					9	22	100	125	
							106	132	

APPENDIX # 1. - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index Age	Height	S.I.$_{50}$	S.I.$_{100}$	Remarks
Cruiser Stony Loam (19)	-	-	-	2-30%	-	-	-	135	Soil and woodland interpretations for Willamette Basin, Oregon, 1970 Progress Repor
" " "	-	-	-	30-50%	-	-	-	133 134	
*Cruiser (19)	NW/NE Sec. 1, T24S, R1W. 11.0 & 1.0 Roads, Francis Ck.	3,500'	S/E	Upper 30-40%	65 69	100 122	86 102 94	104 127 115	Mostly broken tops.
Ritner (24)	NE/SW, Sec. 27, T 25S, R 4 W	1,700'	north	65%	33 32 33 33 32 33	64 68 70 67 64 68	86 92 94 90 88 90 90	105 113 116 110 108 110 110	
Ritner (24)	-	-							
Ritner cobbly clay loam			-	30-60%	-	-	-	130	Soil & woodland interpretations for Willamette Basis, Oregon, 1970 Progress Repor
Ritner cobbly silty clay loam			-	3-30%	-	-	-	133	
Ritner cobbly silty clay loam				30-60%	-	-	-	148 137	
Harrington (29)	Sec. 17, T 25 S, R 1 W, 17.0 Road	-	N/E	70%	47 51 43 47 52	82 87 95 110 95	86 86 104 114 92 96	105 108 130 143 113 119	
Harrington (29)	NW/NW, Sec. 29, T 25 S, R 1 W	2,500'	east	70%	85 65 69 86 80 76	48 47 48 50 48 48	88 68 70 86 82 78 78	108 80 88 105 99 93 94	
Kilchis (35)	SW/SW, Sec. 1, T25S, R2W, 11.1 Rd. Pebble Ck.	-	N/NW	Upper 70-80%	80 85 80 83 85	105 115 100 120 110	82 88 78 92 84 84	99 108 93 113 102 103	Many pistol-butted trees, few old-growth; fire blackened. Salal, sword fern, bracken fern, Ore. grape, vine maple

APPENDIX # 1 - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index Age	Site Index Height	Site Index S.I.$_{50}$	Site Index S.I.$_{100}$	Remarks
Kilchis (35)	Center Sec. 36, T 25 S, R 1 W, 25½-1E-32.0 Road		south	60-70%	80 77 85 84 86	90 80 100 85 105	70 64 76 66 80 71	83 74 90 77 96 84	
Witzel (36)	SE/SE, Sec. 28, T 25 S, R 4 W, High Point	1,600'	N/E	Mid-slope 60-70%	65 65 63	90 87 88	78 76 78 77	93 90 93 92	
Witzel (36)	SE/SE, Sec. 35, T25S, R4W, 13.0 Rd. High Point	1,360'	south	Upper slope 65%	95	95	70	83	Sparse stand mostly cedar, pine, madrone, many broken tops, fire-blackened, poison oak, grass some rockland.
*Twindar (53)	SE/SE Sec. 35, T25S, R4W, 13.0 Rd. High Point	3,000'	S/W	Upper 70%	100 116 110 104 122	125 120 105 115 107	88 81 72 80 70 78	108 IV 98 IV 85 96 IV 83 94	Approximately 2" gravelly surface
Zango (70)	Weyerhauser Road #550, next to rock pit, Conley Ck.	2,500'	south	ridge top 35%	50 62 55 49	63 88 92 82	63 78 87 84 78	73 93 106 102 93	
Zango (70)	NW/NE, Sec. 30, T24S,R1W, Zig Zag Cl	3,200'	SW	60-70% upper, near ridge crest	95 93 85	120 125 100	88 92 76 85	108 113 90 103	Small, very mixed stand; some old growth pine, sugar pine, chinquapin, madrone, bracken fern, salal, beargrass, rockland

APPENDIX # 1. - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index				Remarks
					Age	Height	S.I.$_{50}$	S.I.$_{100}$	
Shivigney(300)	Center Sec. 26, T28S,R3W, 11.1 Rd.	2,960'	S/E	upper, 20-30%	36	85	106	133	
					42	85	96	119	
					41	72	82	99	
					41	81	92	113	
					40	85	98	122	
							94	117	
*Klickitat(323)	NW/SE, Sec. 17, T 25 S, R 1 W, jeep road	3,050'	west	upper, 60-70%	50	80	80	96	Chinquapin, Ore. grape, bracken fern, vine
					50	80	80	96	
					48	95	98	122	
					48	87	88	108	
					50	85	84	102	
							86	104	
Abegg (360)	SW/SW, Sec. 10, T 30 S, R 5 W	1,950'	S/W	top 75-85%	55	75	70	82	
					52	85	84	101	
					47	85	88	107	
					43	100	110	137	
					36	65	82	99	
							86	105	
Abegg (360)	School Hollow NW/SE, Sec. 17, T29S,R4W, 17.0 Rd.	1,900'	N/W	upper slope 40%	65	135	116	146	
					63	120	104	130	
					85	125	94	116	
							105	130	
Chamate (362)	U.S. Plywood Road Sec. 6 T 27 S. R. 2 W.	1,700'	W	30%	68	114	96	119	
					66	93	80	96	
					115	140	94	116	
							90	110	
Kanid (370)	NW/NE, Sec. 27 T31S,R5W, 22.2 Rd.	2,000'	north	upper 50-60%	38	75	90	110	Pistol-butted trees, poison oak, madrone, chinquapin, salal prominent
					45	75	80	96	
					42	70	78	93	
					44	70	76	90	
					35	65	82	99	
							81	97	

APPENDIX # 1 - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index Age	Site Index Height	Site Index $S.I._{50}$	Site Index $S.I._{100}$	Remarks
Kanid (370)	St. John's Ck. 22.0 Rd. SE/SE, Sec. 15, T 30 S, R 3 W	1,600'	south	mid-slope 50-60%	105 120 119 130 120	140 145 140 135 145	96 96 92 90 96 94	119 119 113 110 119 116	Area surrounded by clearcutting. Trunks blackened, sparse stand.
Kanid (370)	Shively Ck. NE/SE, Sec. 3, T 31 S, R 4W	1,300'	east	lower slope 50%	35 33 35	65 65 63	82 86 80 83	99 105 96 100	Slumply, rolling slopes. Sword fern, salal, some alder, S.I. lower than on west side of district.
Beekman (371)	NW/NW, Sec. 4, T31S,R4W, near 4.2 & 28.0 Roads	2,000'	N/W	65%	35 39 36 42 39 37 45 35 35 40	105 105 96 100 100 102 113 112 100 108	134 124 120 112 118 126 122 144 128 126 125	171 157 152 140 149 160 155 186 163 160 159	
Beekman (371)	NE/NE, Sec. 18, T31S,R6W, 12.3 Rd.	2,960'	north	upper 20%	47 39 36 40 39	110 85 90 59 90	114 100 112 110 106 108	143 125 140 138 133 135	
Beekman (371)	NW/NW, Sec. 27 T31S,R5W, 22.2 Rd.	2,000	north	upper 60-65%	50 48 46 45 46	85 80 80 80 85	85 82 84 86 90 85	103 99 102 104 110 103	Poison oak, C. live oak, madrone, thick gravelly surface,
Beekman (371)	NW/SE, Sec. 33, T29S,R3W, 33.4 Rd.	1,600'	south	upper	50 48 49 46 42	65 70 75 70 65	65 72 76 74 72 71	76 85 90 88 85 84	

APPENDIX # 1 DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index Age	Height	S.I.$_{50}$	S.I.$_{100}$	Remarks
Vermisa (372)	SE/NE, Sec. 15, T31S,R5W, 2.0 Rd.	1,200'	E/NE	lower, 75-80%	75	70	56	66	Some rockland, small slumps & slides, scattered old-growth madrone, C. live oak
					73	80	66	77	
					70	85	70	82	
					72	75	62	72	
					70	72	60	70	
							62	73	
Vermisa (372)	NE/SE, Sec. 13, T31S,R5W, 13.0 Rd.	1,600'	north	Upper 85-95%	70	72	60	70	Some rockland, madrone, poison oak, C. live oak, scattered old growth
					55	75	70	83	
					73	90	74	88	
					75	92	74	88	
					65	86	74	88	
							70	83	
Vermisa (372)	NW/NE, Sec. 18, T31S,R5W, 12.3 Rd.	2,800'	south	upper 60-70%	46	68	72	85	
					45	60	64	74	
					44	70	76	90	
					47	60	62	72	
					45	75	80	96	
							70	83	
Pollard (380)	N½corner, Sec. 26 T30S,R4W, 22.0 Rd.	1,600'	north	bottom slope 30-40%	55	105	100	125	Scattered old growth.
					48	95	98	122	
					56	100	94	116	
					48	95	98	122	
					49	105	106	132	
							99	123	
Pollard (380)	NE/SW Sec. 13, T 30 S, R 8 W	1,700'	east	25%	15	40	108	135	
					17	43	102	128	
					16	37	94	116	
					18	45	102	128	
					18	46	104	130	
					16	48	122	155	
							115	132	
Pollard (380)	SE/NW, Sec. 9 T. 30 S, R 8 W	2,350'	west	20%	43	58	64	74	
					44	77	84	102	
					47	77	80	96	
					45	82	88	108	
					48	73	94	116	
					47	92	96	119	
							84	102	

APPENDIX # 1 - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index				Remarks
					Age	Height	S.I.$_{50}$	S.I.$_{100}$	
Pollard (380)	NE/NE, Sec. 1 T 30 S, R 8 W	2,000'	N/W	25%	40 42 41 39 33 41	78 82 82 75 70 81	90 90 94 88 94 92 91	110 110 116 108 116 113 112	
Pollard (380)	NW/NE, Sec. 29 T31S,R4W, 28.1 Rd.	2,400'	south	mid-slope	115 110 105 110 116	145 145 135 140 140	96 98 94 96 94 95	119 122 116 119 116 118	Many jack-strawed trees, few large old growt
McGinnis (381)	NW/NW, Sec. 23, T30S,R4W, 23.0 Rd.	2,000'	N/W	upper 50%	85 80 80 89 105	116 120 130 125 130	88 94 100 92 100 94	108 116 124 113 110 114	Dense understory madrone and young fir. Centers of many cores rotten and decomposed.
McGinnis (381)	NW/NE, Sec. 27 T31S,R5W, 22.2 Rd.	2,000'	north	upper 70-80%	45 40 40 43 39	85 80 90 100 90	90 92 104 110 106 100	110 113 130 137 132 124	Few old growth; some pistol-butted trees.
McGinnis (381)	SE/SW, Sec. 29 T 31 S. R 4 W	2,400'	N/E	30 - 50%	21 21 22 20 22 22 22 20 20	29 27 31 31 31 29 29 26 24	93 85 90 111 136 93 94 91 93 98	114 103 110 139 109 115 116 111 114 114	Shively Ck. fertilizer study plot.

APPENDIX # 1 - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index				Remarks
					Age	Height	$S.I._{50}$	$S.I._{100}$	
McGinnis (381)	NW/NW, Sec. 6 T31S,R4W, 6.1 R .	2,000'	south	upper 40%	67	80	68	80	Stand recently partial-cut & hardwoods killed. Poison oak & madrone.
					60	75	68	80	
					61	70	62	72	
					70	82	68	80	
					60	80	72	86	
							67	79	
Tishar (382)	NW/NE Sec. 27, T31S,R5W, 22.2 Rd.	2,000'	north	upper 70%	52	95	92	113	Some pistol-butted trees.
					45	90	96	119	
					46	100	106	132	
					46	90	94	116	
					45	95	96	119	
							96	119	
Tishar (382)	SW/SW, Sec. 1, T31S,R5W, 12.0 Rd.	1,200'	N/A	mid-slope 80-90%	83	115	88	108	Benchy ground and bent trees. Few old growth lots of poison oak, madrone.
					65	110	94	116	
					65	115	98	122	
					67	92	78	92	
					64	100	86	105	
							88	108	
Tishar (382)	NW/NW, Sec. 7, T31S,R4W, 6.1 Rd.	2,000'	south	upper 40%	68	85	72	85	Hardwoods recently sprayed. Some partial cutting. Madrone & whipplea & poison oak.
					75	80	64	74	
					71	85	70	83	
					68	85	72	85	
					75	82	66	77	
							68	80	
Larmine (393)	Brush Ck., Wooly Logging Road	400'	north	upper slope 75%	65	95	82	99	Over very hard & massive bedrock.
					57	75	70	83	
					65	80	70	83	
					62	87	78	93	
							75	89	
Larmine (393)	Brads Ck. NE/NE Sec. 11 T23S,R7W, 11.2 Rd.	800'	south	upper slope 75-80%	35	70	90	110	Over very soft and highly fractured bedrock.
					42	76	86	105	
					41	72	62	99	
					41	75	80	96	
							80	102	

APPENDIX # 1 - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index Age	Site Index Height	Site Index $S.I._{50}$	Site Index $S.I._{100}$	Remarks
Atring (394)	Brads Creek NE/NE, Sec. 11 T23S,R7W, 11.2 Rd.	800'	south	upper slope 60%	43	95	104	130	Soft, highly fractured bedrock.
					41	85	96	119	
					45	88	94	116	
					41	77	88	108	
					45	92	98	122	
					42	90	100	125	
							97	120	
Atring (394)	Sec.29.,T25S, R4W Foster Creek	1,600'	east	65% upper slope	59	115	104	130	
					63	127	110	138	
					69	134	112	140	
							108	136	
Renhaven (395)	Sec. 29, T25S, R4W, Foster Ck.	1,580'	east	upper slope 65%	59	115	104	130	Umpqua sandstone, few old growth nearby.
					63	127	110	138	
					69	134	112	140	
							108	136	
Bateman (396)	NW/NW Sec. 17, T25S,R4W, 3/4 mi. up 8.1 Rd.	1,200'	north	20-30% lower slop	37	80	98	122	Scattered madrone, oak, poison oak
					38	80	96	119	
					38	75	90	110	
					41	80	92	113	
					37	82	100	125	
							95	117	
Bateman (396)	Sec. 30,T25S,R4W	800'	north	20%	36	83	104	130	
					33	70	94	116	
					38	79	94	116	
							97	121	
					34	84	110	138	In creek bottom
					35	78	100	125	
					4k	96	110	138	
					36	75	94	116	
					37	86	106	133	
					36	86	108	135	
					37	80	98	122	
							103	129	
Darby (397)	SE/SE, Sec. 28, T25S,R4W, High Point	1,600'	W/SW	65% upper	75	85	70	83	Partial cut. Many tops out, pistol-butted trees. Grass, cedar, poison oak, pine.
					77	90	72	85	
					25	50	84	102	
					20	45	92	113	
							79	95	

APPENDIX # 1. - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index Age	Site Index Height	Site Index S.I.$_{50}$	Site Index S.I.$_{100}$	Remarks
Darby (397)	SW/SW Sec. 27, T25S,R4W, 26.0 Rd. High Point	1,680'	north	65% upper	43 45 40 45	70 90 85 85	78 96 86 90 87	93 119 105 110 106	Madrone, alder, big leaf maple, bracken & sword fern, few scattered old growth stumps.
Holderman (400)	NE/NW, Sec. 24 T 24 S, R 1 W	3,000'	N/W	upper slope 70%	110 108 105 114 108	70 80 80 85 75	50 56 58 58 54 55	- below site V - - -	Soil 24" deep 60% C/F, rhododendron, salal Ore. grape
Holderman (400)	SE/SE Sec. 1 T24S,R1W , 1.1 Rd. Francis Ck.	3,200'	N/E	80% upper slope	75 70 70 71 70	95 95 93 77 80	78 80 78 64 68 73	93 96 93 74 80 87	35" to bedrock, 35% C F, rhododendron, salal chinquapin
Holderman (400)	NW/SW, Sec. 35 T23S, R1W, jeep rd.	3,850'	south	mid-slope 60-80%	75 75 72 72 74	85 92 80 100 108	68 74 66 82 87 75	80 88 77 99 106 90	Soil 38" deep, 40% C F, highly fractured rock with soil in cracks.
Holderman (400)	Center Sec. 1, T24S,R1W, 11.0 Rd. Echo Rock	3,750'	south	mid-slope 70-80%	70 70 70	85 85 85	72 72 72 72	85 85 85 85	
Winberry (410)	Center Sec. 1, T24S,R1W, 11.0 Rd. Echo Rock	3,750'	south	mid-slope 70-80%	70 70	85 85	72 72 72	85 85 85	
Winberry (410)	SW/SW, Sec. 8 T24S,R1W, Mellow Moon Ridge	4,000'	south	upper 50-60%	93 95 92 88	83 74 71 82	62 54 53 62 57	72 70 70 72 71	Lithic contact. Rockland associated. Princess pine, manzanita, twin flower, rhododendron.
Siskiyou (721)	NE/SE, Sec. 13 T30S,R3W, 13.1 Rd,	1,600'	N/E	top 40-50%	178 125 225 130 132	115 130 150 120 125	76 90 90 83 90 85	90 110 110 100 110 104	Some old cutting. Pine, Grand fir & cedar.

APPENDIX # 1. - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index				Remarks
					Age	Height	S.I.$_{50}$	S.I.$_{100}$	
Siskiyou (721)	SE/NE, Sec. 20 T31S,R2W, F.S. Rd. #3130	2,250'	N/E	mid-slope	75	93	74	88	
					80	95	74	88	
					77	102	82	99	
					75	90	72	85	
					82	95	74	88	
							75	89	
Siskiyou (721)	SE/NE, Sec. 17 T31S,R2W, F.S. Rd. #302	2,500'	south	mid-slope	68	85	72	85	
					76	80	64	74	
					65	90	78	93	
					67	77	66	77	
					73	80	66	77	
							69	81	
Holland (722)	NW/NW, Sec. 30 T28S,R3W, Slide Ck.	1,600'	north	mid-slope 65-70%	98	120	86	105	
					113	127	86	105	
					120	144	96	119	
					112	125	84	102	
					115	137	92	113	
							88	108	
Holland (722)	SW/SW, Sec. 20, T28S, R3W, 20.0 & 34.0 junction Slide Ck.	2,000'	south	top 30%	61	80	72	85	Stand developing under madrone, now topping it
					65	85	74	88	
					64	92	63	73	
					59	80	72	85	
					62	85	76	90	
							71	84	
Holland (722)	Sec. 32, T28S,R3W Sec. 5, T29S,R3W	1,600'	south	35%	34	67	78	93	
					31	53	74	88	
					36	60	74	88	
					36	74	92	113	
					34	60	76	90	
					34	57	74	88	
							78	93	
Holland (722m)	SE/SE, Sec. 22, T29S,R4W, new rd.	1,200'	north	lower slope 50%	18	50	114	143	Cedar, pine, Grand fir & Douglas-fir all equal growth.
					20	55	114	143	
					25	50	84	102	
					22	52	96	119	
					21	50	98	122	
							101	125	

APPENDIX # 1 - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index				Remarks
					Age	Height	S.I.$_{50}$	S.I.$_{100}$	
Holland (722m)	NW/NW, Sec. 10 T30S,R5W, 14.0 Rd. Morgan Ck.	1,440'	S/W	mid-slope 40-50%	122 115 100 105 102	110 115 125 135 110	76 83 90 97 83 85	90 100 110 120 100 104	Dense grass & poison oak. Wide spacing
Barron (723)	NW/SE, Sec. 1 T31S, R3W, 1.1 Rd. Stouts Ck.	2,000'	north	15% broad ridge	56 54 54 55 46	94 78 80 83 80	88 74 76 78 84 80	108 88 90 93 102 96	
Barron (723)	NW/SE Sec. 1 T31S,R3W, 1.1 Rd. Stouts Ck.	2,000'	south	15% broad ridge	53 54 60 50 48	106 87 85 86 90	102 84 76 86 92 88	128 102 90 105 113 107	
Lettia (724)	Sec. 12, T31S,R3W 12.0 Rd.	2,200'	south	mid-slope	62 61 60 73	85 90 83 75	76 80 58 62 69	90 96 -- 72 86	
Lettia (724m)	NE/NW, Sec. 3 T29S,R4W, 34.1 Rd. Slide Ck.	1,200'	north	lower slope	54 59 59 57 59	105 100 115 90 115	100 90 104 84 104 96	125 110 130 102 130 119	
Lettia (724m)	SE/SE, Sec. 10 T30S,R5W 14.0 Rd. Gazley Ck.	1,400'	S/W	45% mid-slope	79 81 105 95 86 87	120 125 132 135 125 120	94 96 92 98 94 90 94	116 119 113 122 116 110 116	Slumpy ground, bent trees.

APPENDIX # 1 - DETAILED SITE INDEX DATA

Soil	Location	Elevation	Aspect	Position on Slope	Site Index				Remarks
					Age	Height	S.I.$_{50}$	S.I.$_{100}$	
Vena (731)	NW/NW, Sec. 11 T30S,R2W, 3.2 Rd.	3,100'	south	upper 45-50%	90 110 105 125 125	55 60 57 70 65	Below 50		Rocky surface, next to rock pit & clear cut.
Selmac (743)	SE /SE, Sec. 10 T30S,R2W, 14.0 Rd.	2,500'	flat	Nearly level	49 51 53 49 53	77 80 70 65 72	78 80 68 66 70 72	93 96 80. 77 82 85	Many bent trees.

IX. LITERATURE CITED

1. American Forest Institute. 1972. The Effects of Clearcut Harvesting on Forest Soils. The American Forest Institute, 1619 Massachusetts Avenue N.W., Washington D.C. 20036.

2. Baldwin, E. M. 1964. Geology of Oregon. University of Oregon Coop Book Store, Eugene, Oregon. 2nd edition. Edward Brothers, Inc., Ann Arbor, Michigan.

3. Brown, G. W. 1972. The Alsea Watershed Study, Pacific Logging Congress, Vol. XXXII, Loggers Handbook.

4. Brown, G. W., A. R. Gahler and R. B. Morston. 1973. Nutrient Losses after Clearcut Logging and Slash Burning in the Oregon Coast Range. Water Resources Research. Vol. 9, No. 5. p. 1450-1453.

5. Brown, G. W. and J. T. Krygier. 1971. Clearcut Logging and Sediment Production in Oregon Coast Range. Water Resources Research 7(5), p. 1189-1198.

6. Burroughs, Edward R., Jr.; George Chalfant and Martin A. Townsend, 1972. Guide to Reduce Road Failures in Western Oregon. Bureau of Land Management, Portland, Oregon.

7. Cole, D. W., S. P. Geasel and S. F. Dice. 1967. Distribution and Cycling of Nitrogen, Phosphorous, Potassium and Calicium in a Second-Growth Douglas-fir Ecosystem. In Proc. Sym. Primary Productivity and Mineral Cycling in Natural Ecosystems. Ecol. Soc. of American, University of Maine Press. December 27, 1967. p. 198-232.

8. Corliss, John F. 1973. Soil Survey of Alsea Area, Oregon. USDA, Soil Conservation Service and Forest Service; USDI, Bureau of Land Management; Oregon Board of Natural Resources; and Oregon Agricultural Experiment Station. Supt. of Documents, U.S. Govt. Printing Office, Washington, D.C. 82 pp., maps.

9. de Moulin, L. A., J. A. Pomerening, and B. R. Thomas. 1975. Soil Inventory of the Medford District. USDI, Bureau of Land Management, Oregon State Office, Portland. 261 pp., maps.

10. Diller, J. S. 1898. Description of the Roseburg Quadrangle. U. S. Geol. Survey. Geol. Atlas, Folio 49.

11. Douglas County Commissioners. 1968. The Character of Douglas County. Roseburg, Oregon.

12. Dyrness, C. T. 1970. Factors in Regeneration Success. A Talk Presented to Region 6 Silviculture conference, Seattle, Washington. U. S. Forest Service.

13. Edgren, J. W. 1972. Factors in Regeneration Success. A Talk Presented to Region 6 Silviculture Conference, Seattle, Washington. U. S. Forest Service.

14. Elphic, L. G. 1969. Geology of the Southern One-Third of the Glide Quadrangle, Oregon. M. S. Thesis, University of Oregon, Eugene, Oregon.

15. Fredriksen, R. L. 1970. Erosion and Sedimentation Following Road Construction and Timber Harvest on Unstable Soils in Three Small Western Oregon Watersheds. USDA, Forest Service Research Paper, PNW-104.

16. Fredriksen, R. L., D. G. Moore and L. A. Norris. 1975. The Impact of Timber Harvest, Fertilization and Herbicide Treatment on Streamwater Quality in Western Oregon and Washington in Forest Soils and Forest Land Management, 4th North American Forest Soils Conference, Laval University, Quebec.

17. Froehlick, H. A. 1973. The Impact of Even-Age Forest Management on Physical Properties of Soils. From Even-Age Management Sym. Paper 348. Corvallis, Oregon, Oregon State University.

18. Hoover, L. 1963. Geology of the Anlauf and Drain Quadrangles. Douglas and Lane Counties, Oregon. Geological Survey Bul. 1122-D. U. S. Government Printing Office, Washington D.C.

19. King. J. E. 1966. Site Index Curves for Douglas-fir in the Pacific Northwest Weyerhaeuser Forestry Paper No. 8. Centralia, Washington.

20. Lane County Commissioners. 1972. Lane County Soil Association Map with Interpretive Guides. In Cooperation with USDA, Soil Conservation Service and Oregon State University. 24 pp.

21. McArdle, R. E., W. H. Meyer and D. Bruce. 1930 (Rev. 1949). The Yield of Douglas-fir in the Pacific Northwest. U. S. Dept. of Agriculture Technical Bull. No. 201, 74 pp.

22. Megahan, W. F. and W. J. Kidd. 1972. Effects of Logging Roads on Sediment Production Rates in the Idaho Batholith. USDA Forest Service Res. Paper INT-123.

23. Mersereau, R. C. and C. T. Dyrness. 1972. Accelerated Mass Wasting After Logging and Slash Burning in Western Oregon. Journal of Soil and Water Conservation, May-June, 1972.

24. Miller, R. E. and S. R. Wert. 1975. Shively Creek Fertilizer Study; Spray vs Prill Fertilizer; Progress Report on file at Roseburg Bureau of Land Management Office.

25. Pomerening, J. A., R. C. Paeth, E. G. Knox, and G. H. Simonson. 1969. Umpqua Drainage Basin General Soil Map Report with Irrigable Areas. Oregon Agr. Exp. Sta., U.S.D.A., Soil Conservation Service; and Oregon State Water Resources Bd. 77 pp., maps.

26. Ramp, Len. 1972. Geology and Mineral Resources of Douglas County, Oregon. State of Oregon, Dept. of Geology and Mineral Industries, Bul. 75.

27. Richlen, Ellsworth M. and F. R. Stephens. 1973. Soil Survey of the South Umpqua Area, Oregon. U. S. Dept. of Agriculture and Oregon Agricultural Experiment Station. Supt. of Doc. U.S. Govt. Printing Office, Washington, D.C.

28. Scott, W. 1973. Some Soil Factors Affecting Snowbrush Noduation. PhD Thesis, Oregon State University, Department of Soils. 103 pp.

29. Soil Survey Staff. 1951. Soil Survey Manual, U. S. Dept. of Agriculture Handbook No. 18. U.S. Govt. Printing Office, Washington, D.C.

30. Soil Survey Staff. 1970. Selected Chapters from the Unedited Text of the Soil Taxonomy of the National Cooperative Soil Survey. U.S. Dept. of Agriculture, Soil Conservation Service, Washington, D.C.

31. Sterns, G. L. 1960. Climate of the States; Oregon. U.S. Weather Bureau, Washington, D.C. No. 60-35.

32. Thomas, B. R., J. A. Pomerening, and G. H. Simonson. 1969. Reconnaissance Soil Survey of the Willamette Basin, Oregon, Segment III; Uplands Outside National Forests. Oregon Agr. Exp. Stat, Special Report 269. 131 pp., maps.

33. Thomas, B. R. 1970. The Role of Soil-Water Depletion and Plant Moisture Stress in Soil Classification and Cambial Activity of fir. PhD Thesis, Oregon State University, Corvallis, 115 pp.

34. Thomson, R. L. 1968. The Geology of the Middle One-Third of the Glide Quandrangle, Oregon. M.S. Thesis, University of Oregon Eugene, Oregon.

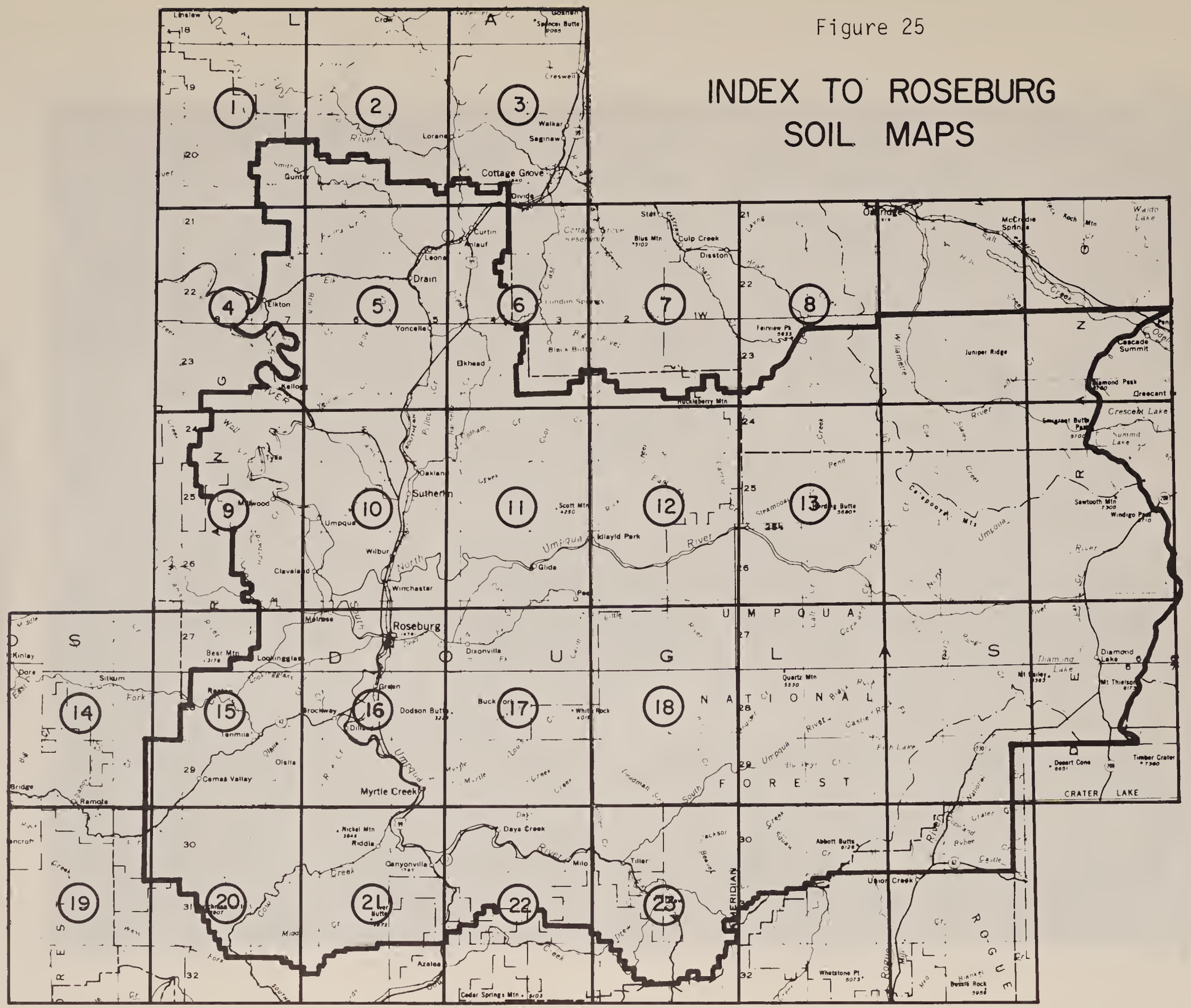
35. Wells, Francis G. and D. L. Peck. 1961. Geologic Map of Oregon West of the 121st Meridian. Map I-325. Oregon Dept. of Geology and Mineral Industries.

36. Williams, L. H., et. al. 1972. Soil Survey of Marion County Area, Oregon. 1972. U.S. Dept. of Agriculture, Soil Conservation Service in cooperation with the Oregon Agriculture Experiment Station.

37. Wollum, A. G., C. T. Youngberg and F. W. Chichester. 1963. Relation of Previous Timber Stand Age to Noduation of Ceanothus velutinus. Forest Science, Vol. 14, No. 2.

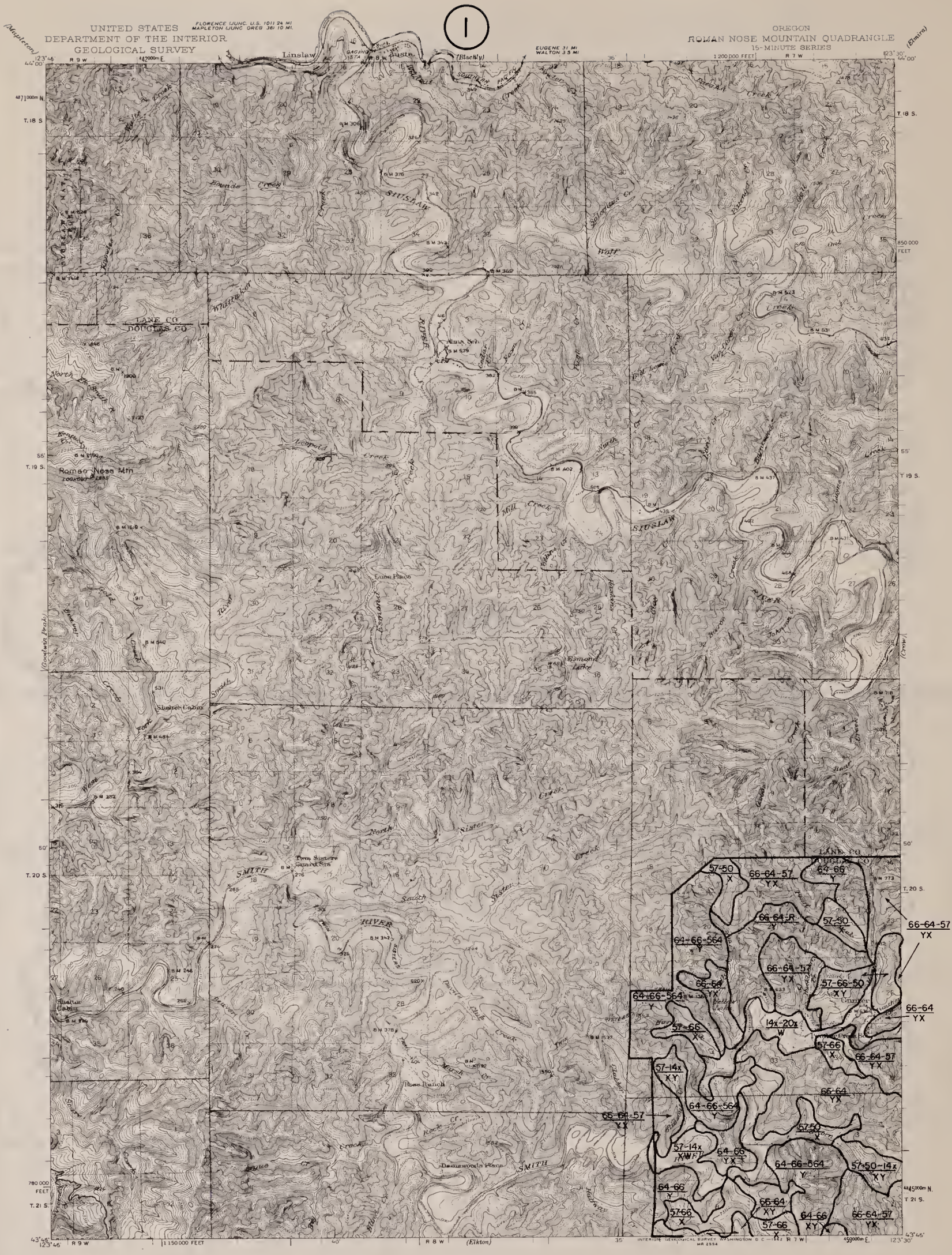
Figure 25

INDEX TO ROSEBURG SOIL MAPS


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Roseburg
Cottage Grove
Elkton
Yoncalla
Drain
Oakland
Sutherlin
Umpqua
Wilbur
Winchester
Glide
Idleyld Park
Dixonville
Myrtle Creek
Days Creek
Tyee
Milwood
Clavalard
Looking Glass
Tenmile
Camas Valley
Remote
Riddle
Canyonville
Mila
Azalea
Elkhead
Curtin
Leona
Kellogg
Diamond Peak
Crescent
Crescent Lake
Summit Lake
Cascade Summit
Juniper Ridge
Sawtooth Mtn
Windigo Pass
Diamond Lake
Mt Thielsen
Timber Crater
Desert Cone
CRATER LAKE
Fish Lake
Union Creek
Abbott Butte
Whetstone Pt.
Quartz Mtn
Dodson Butte
Buckhorn
Brockway
Green
Milo
Tiller
Nickel Mtn
Cedar Springs Mtn.
Bunker Hill
Coos Bay
Willamette
Umpqua
Rogue
Calapooya Mts
Cascade Mts
Cottage Grove Reservoir
Fairview Pk
Huckleberry Mtn
Culp Creek
Diston
Blue Mtn
Spencer Butte
Creswell
Walkar
Saginaw
Gunter
Curtin
Ahlauf
Elkton
Yoncalla
Drain
Elkhead
Kellogg
Tyee
Milwood
Oakland
Sutherlin
Umpqua
Wilbur
Winchester
Clavalard
Glide
Idleyld Park
Scott Mtn
Dixonville
Roseburg
Looking Glass
Tenmile
Camas Valley
Remote
Myrtle Creek
Riddle
Nickel Mtn
Canyonville
Days Creek
Mila
Azalea
Cedar Springs Mtn.
Dodson Butte
Brockway
Green
Buckhorn
White Rock
Milo
Tiller

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

OREGON
ROMAN NOSE MOUNTAIN QUADRANGLE
15-MINUTE SERIES



SCALE 1 62500

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

2

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

OREGON
CROW QUADRANGLE
15-MINUTE SERIES

SCALE 1 62500

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

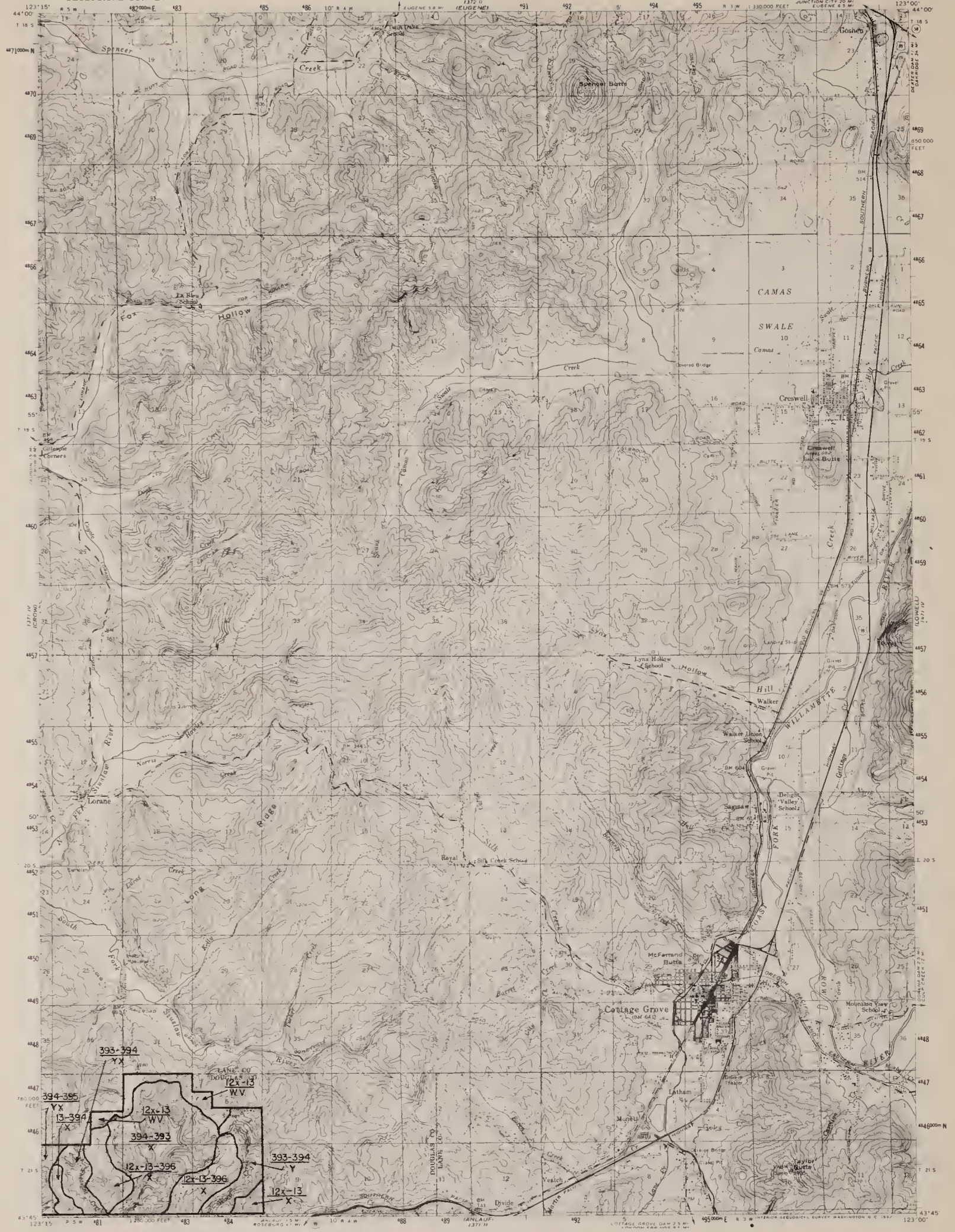
SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

3

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COTTAGE GROVE QUADRANGLE
OREGON
15 MINUTE SERIES (TOPOGRAPHIC)



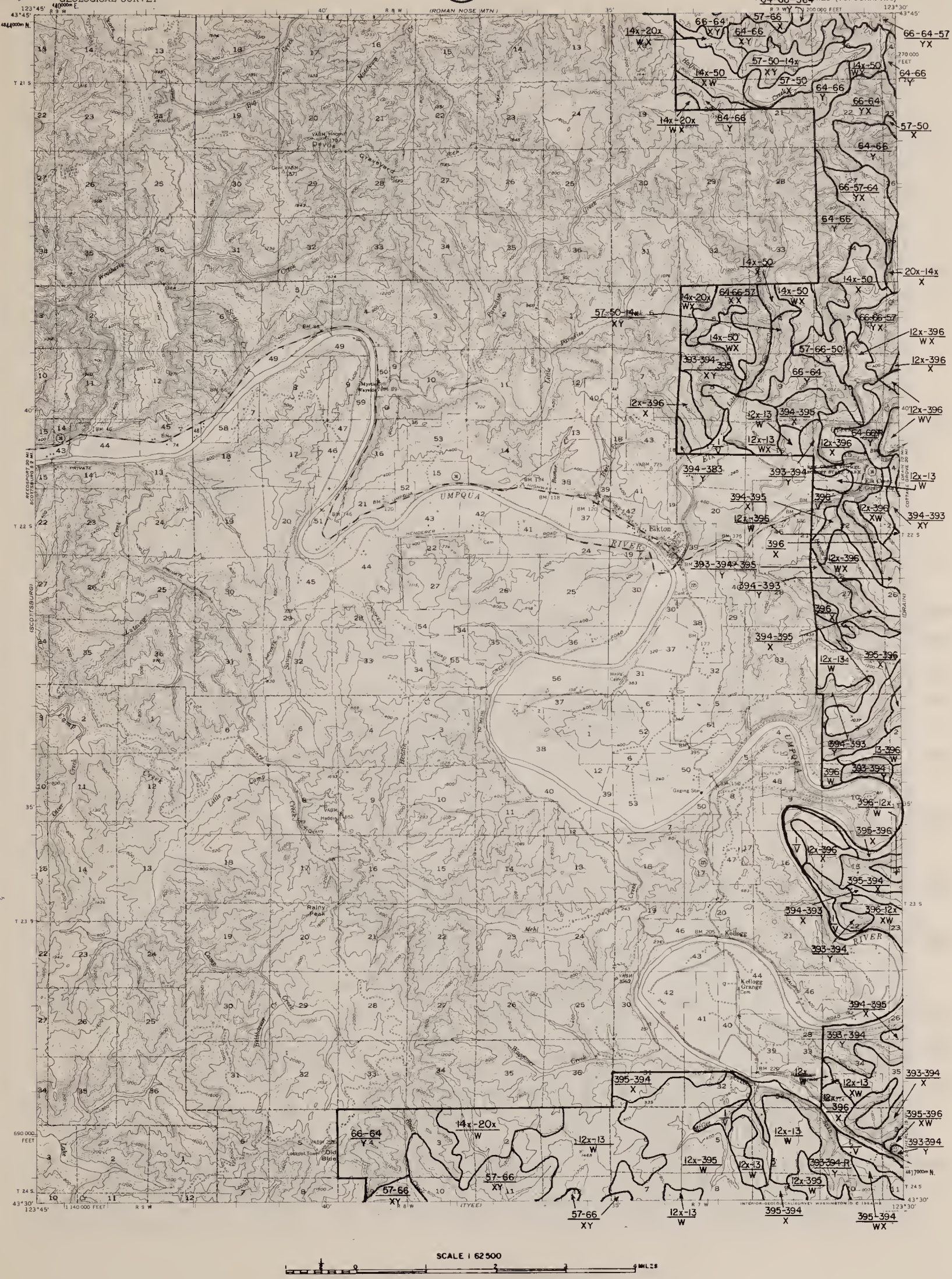
SCALE 1 62500

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976
ROSEBURG DISTRICT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ELKTON QUADRANGLE
OREGON—DOUGLAS CO.
SERIES (TOPOGRAPHIC)



SCALE 1 62500

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

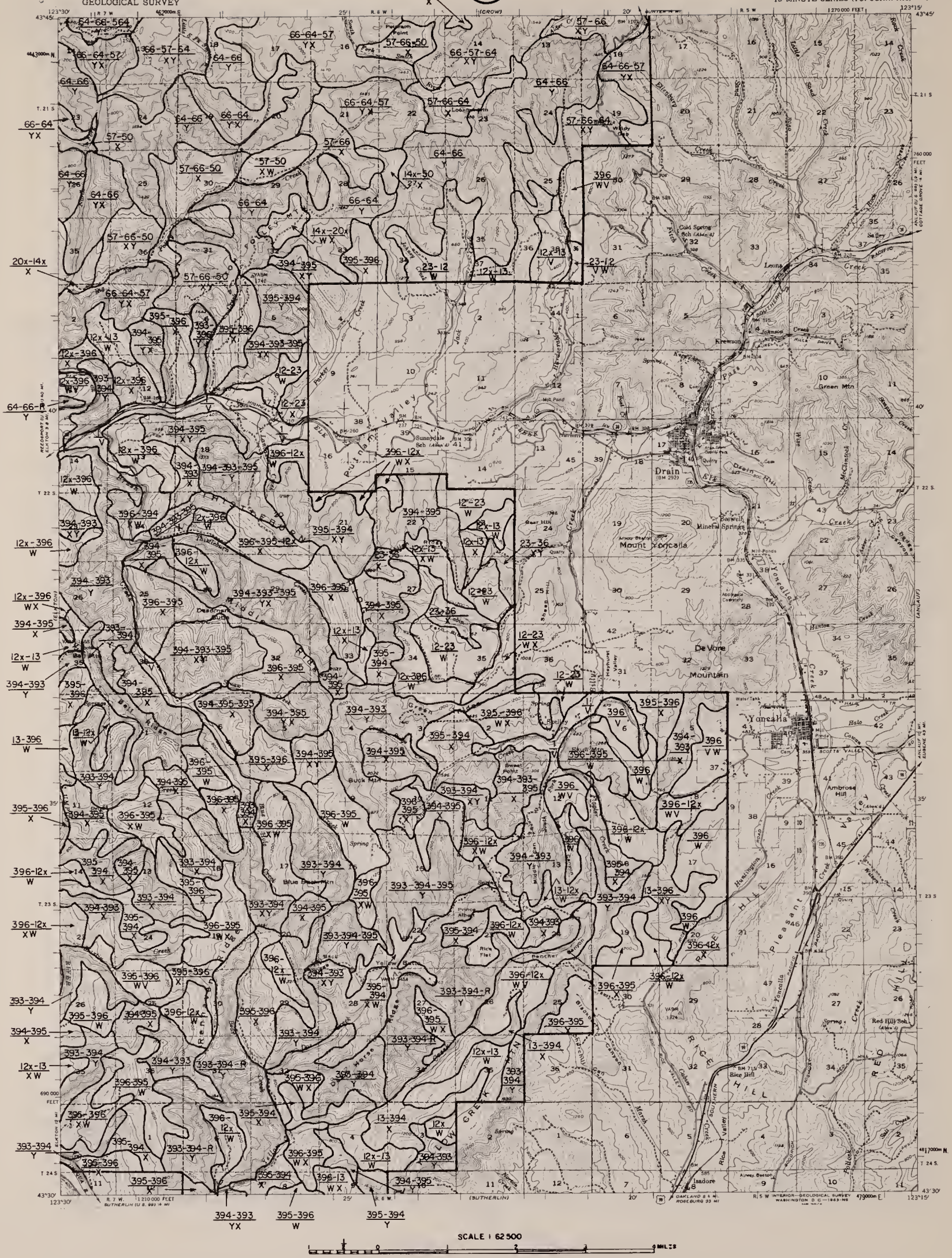
SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

5

DRAIN QUADRANGLE
OREGON—DOUGLAS CO.
15 MINUTE SERIES (TOPOGRAPHIC)



SCALE 1 62500

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

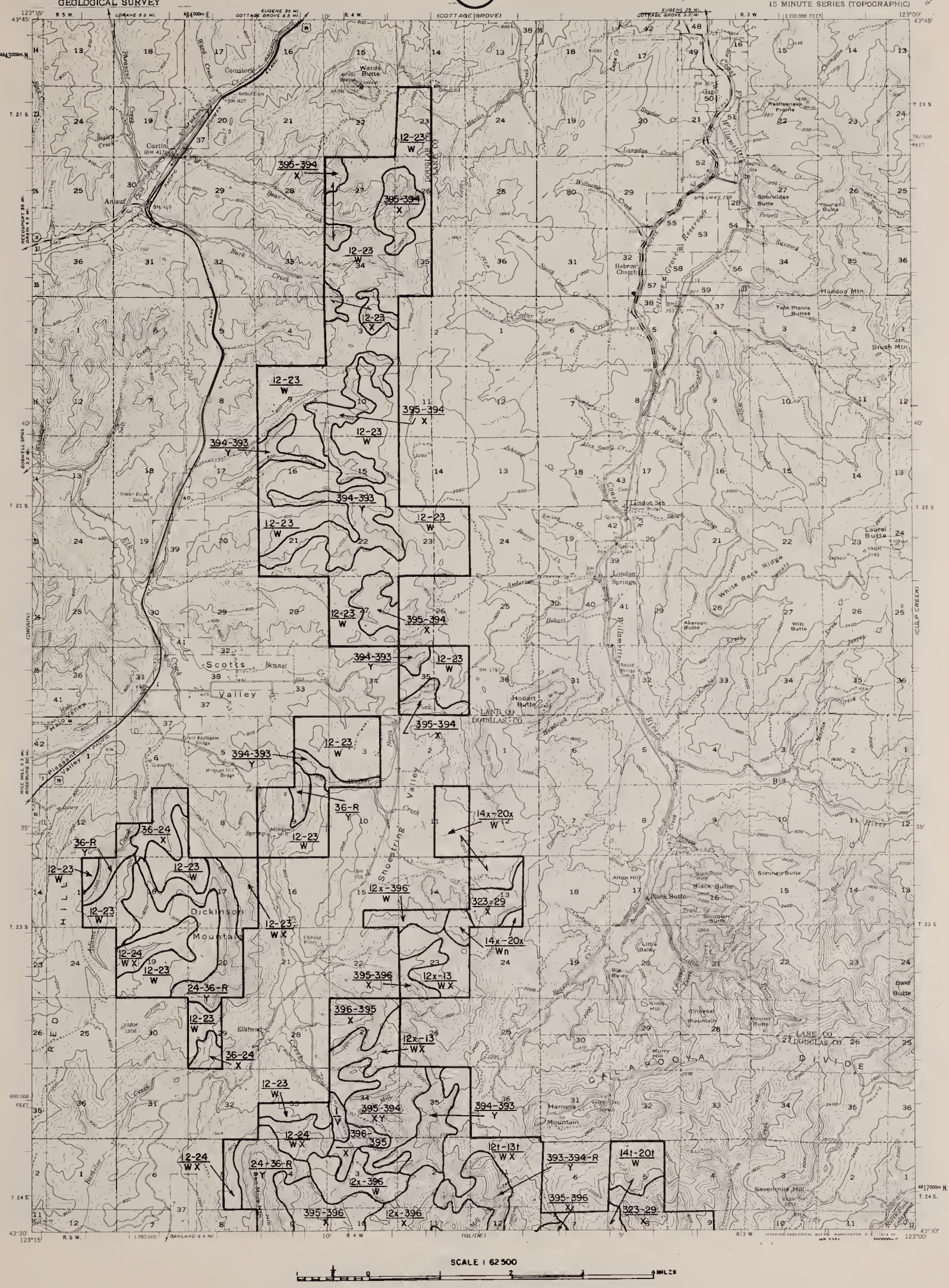
SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

6

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ANLAUF QUADRANGLE
OREGON
15 MINUTE SERIES (TOPOGRAPHIC)



SCALE 1 62 500

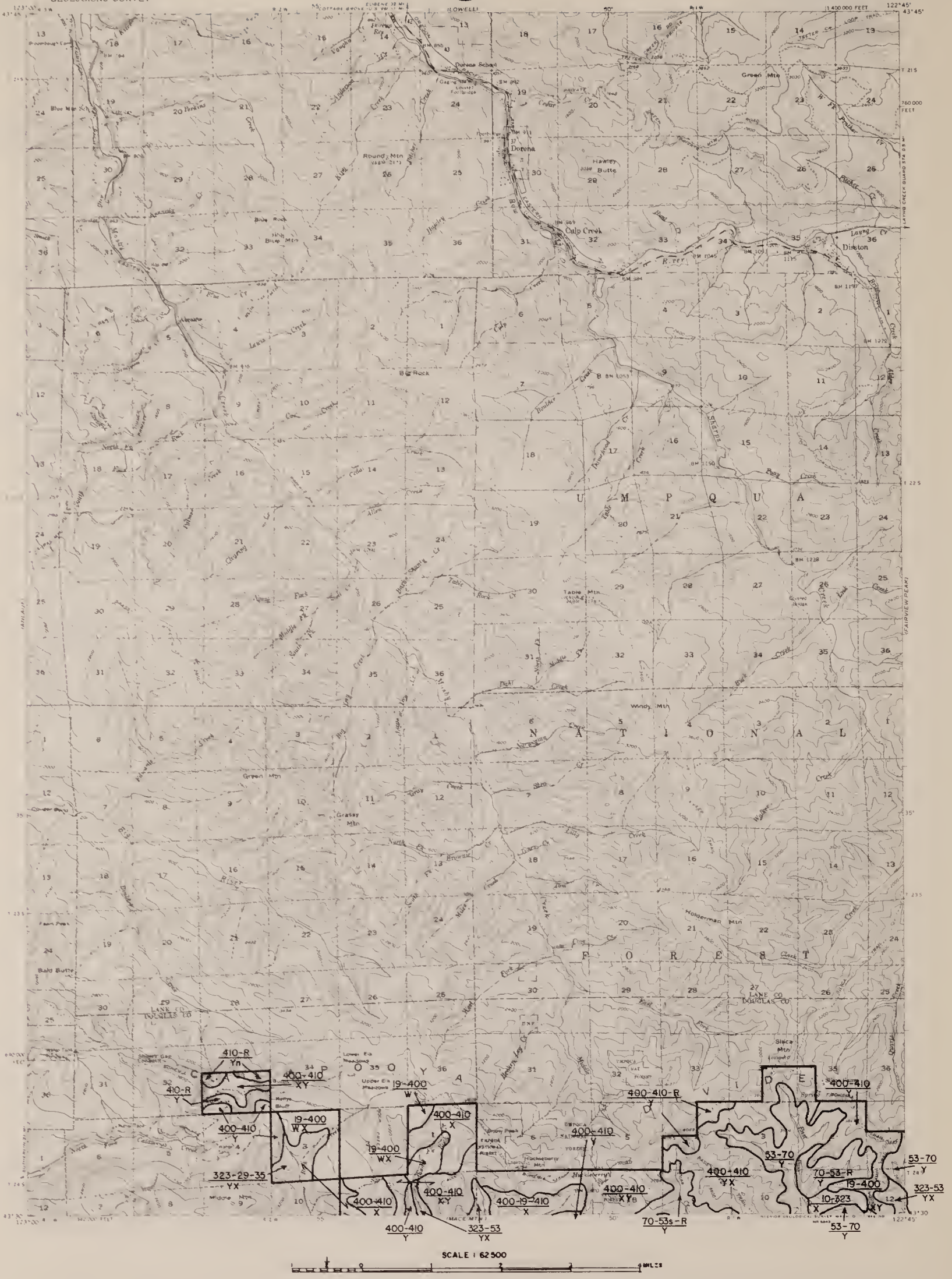
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976
ROSEBURG DISTRICT

7

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CULP CREEK QUADRANGLE
OREGON
15 MINUTE SERIES TOPOGRAPHIC



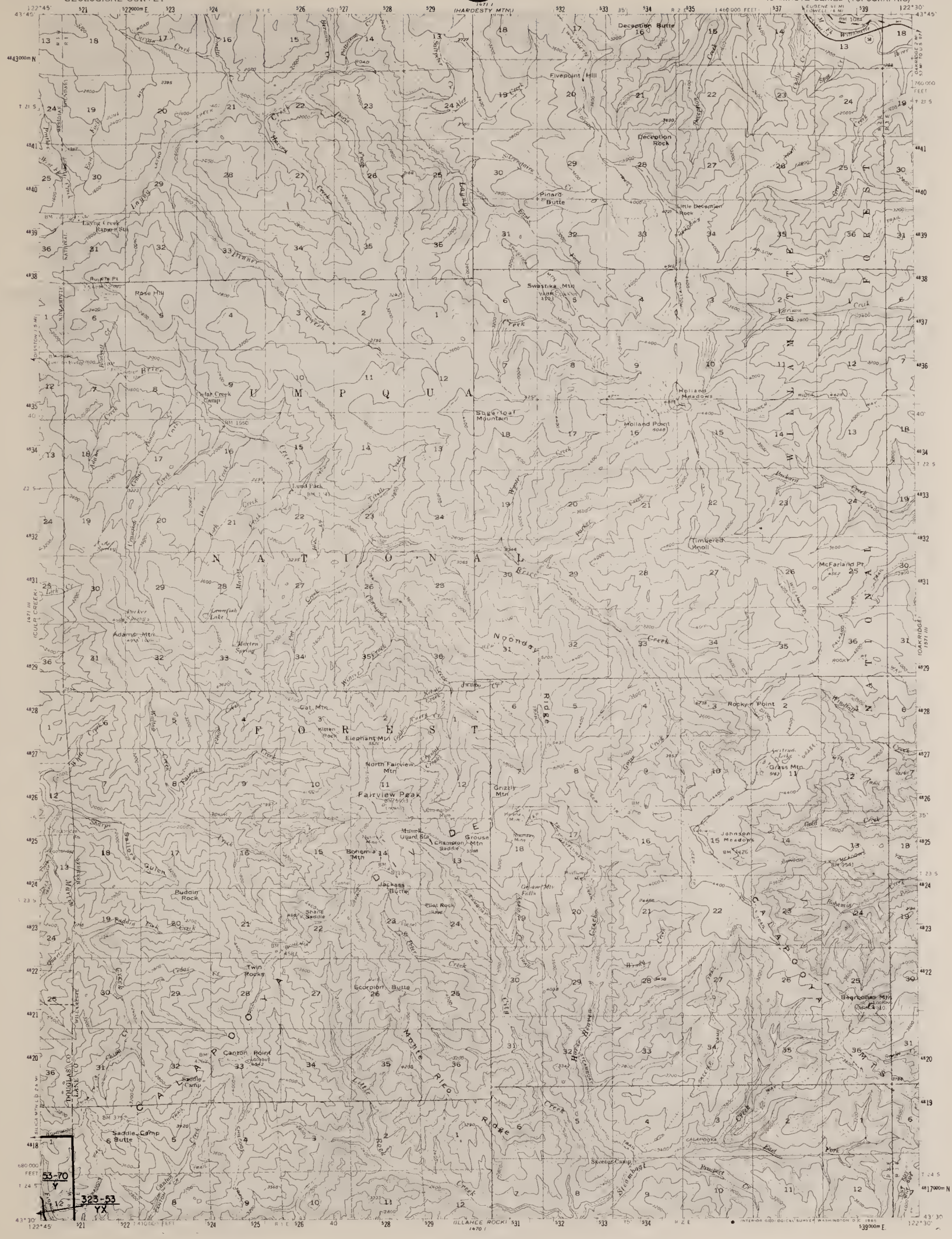
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976
ROSEBURG DISTRICT

8

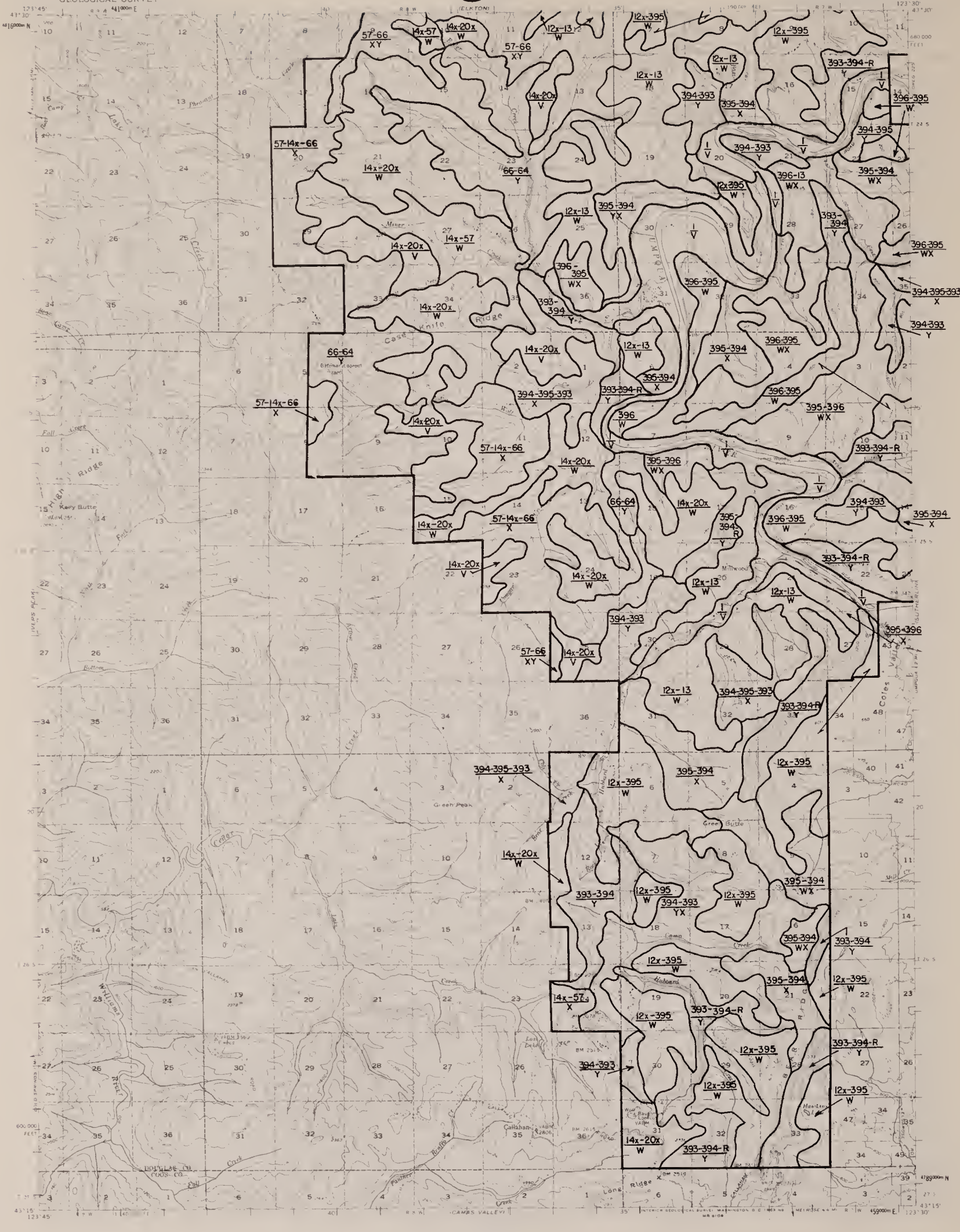
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FAIRVIEW PEAK QUADRANGLE
OREGON
15 MINUTE SERIES (TOPOGRAPHIC)


Deception Butte
Fivepoint Hill
Deception Rock
Pinard Butte
Little Deception Rock
Swastika Mtn
Holland Meadows
Sheep Boat Mountain
Holland Point
Timbered Knoll
McFarland Pt
Rose Hill
Cedar Creek Camp
Adams Mtn
Western Spring
Grumpish Lake
Cat Mtn
Elephant Mtn
North Fairview Mtn
Fairview Peak
Grizzly Mtn
Grouse Mtn
Champion Saddle
Bohemia Mtn
Jackass Butte
Johnson Meadows
Grass Mtn
Rocky Point
Buddin Rock
Shale Saddle
Twin Rocks
Scorpion Butte
Canton Point
Saddle Camp Butte
Bearpaw Mtn
Skeeter Camp
Indian Ridge
Noonday Ridge
Mantle Ridge
Hoffer Ridge
Parker Ridge
Calapooya Creek
Mantle Creek
Little Mantle Creek
Buddin Creek
Bohemia Creek
Canton Creek
Indian Creek
Parker Creek
Holland Creek
Grass Mtn Creek
Deception Creek
Pinard Creek
Irving Creek
Rapeer Sch
Rose Hill Pt
Cedar Creek Camp
Saddle Camp
Skeeter Camp
Timbered Knoll
McFarland Pt
Bearpaw Mtn
Johnson Meadows
Holland Meadows
Sheep Boat Mountain
Holland Point
Deception Butte
Fivepoint Hill
Deception Rock
Pinard Butte
Little Deception Rock
Swastika Mtn
Rose Hill

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TYEE QUADRANGLE
OREGON
15 MINUTE SERIES (TOPOGRAPHIC)



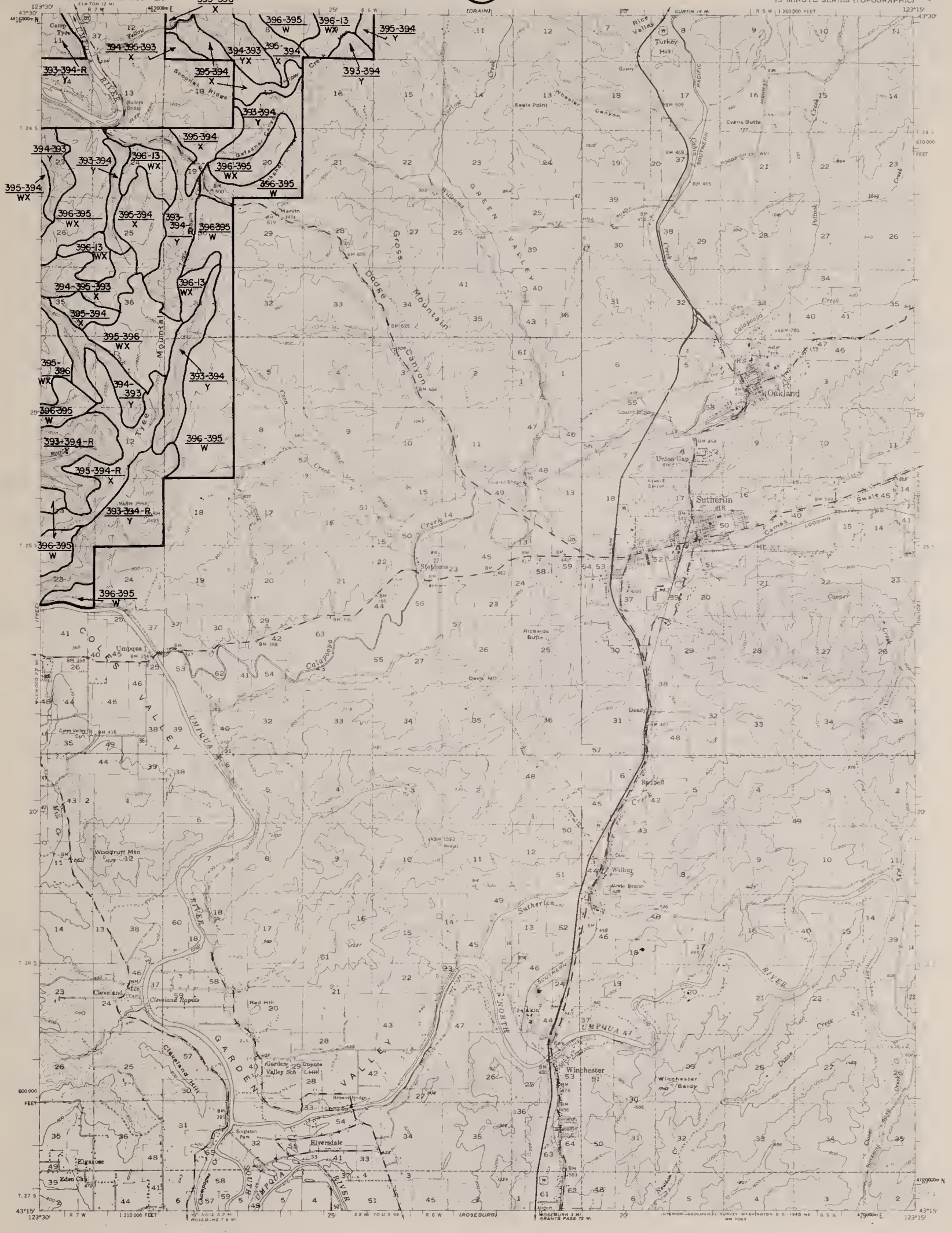
SCALE 1 62500

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976
ROSEBURG DISTRICT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUTHERLIN QUADRANGLE
OREGON—DOUGLAS CO.
15 MINUTE SERIES (TOPOGRAPHIC)



SCALE 1 62500

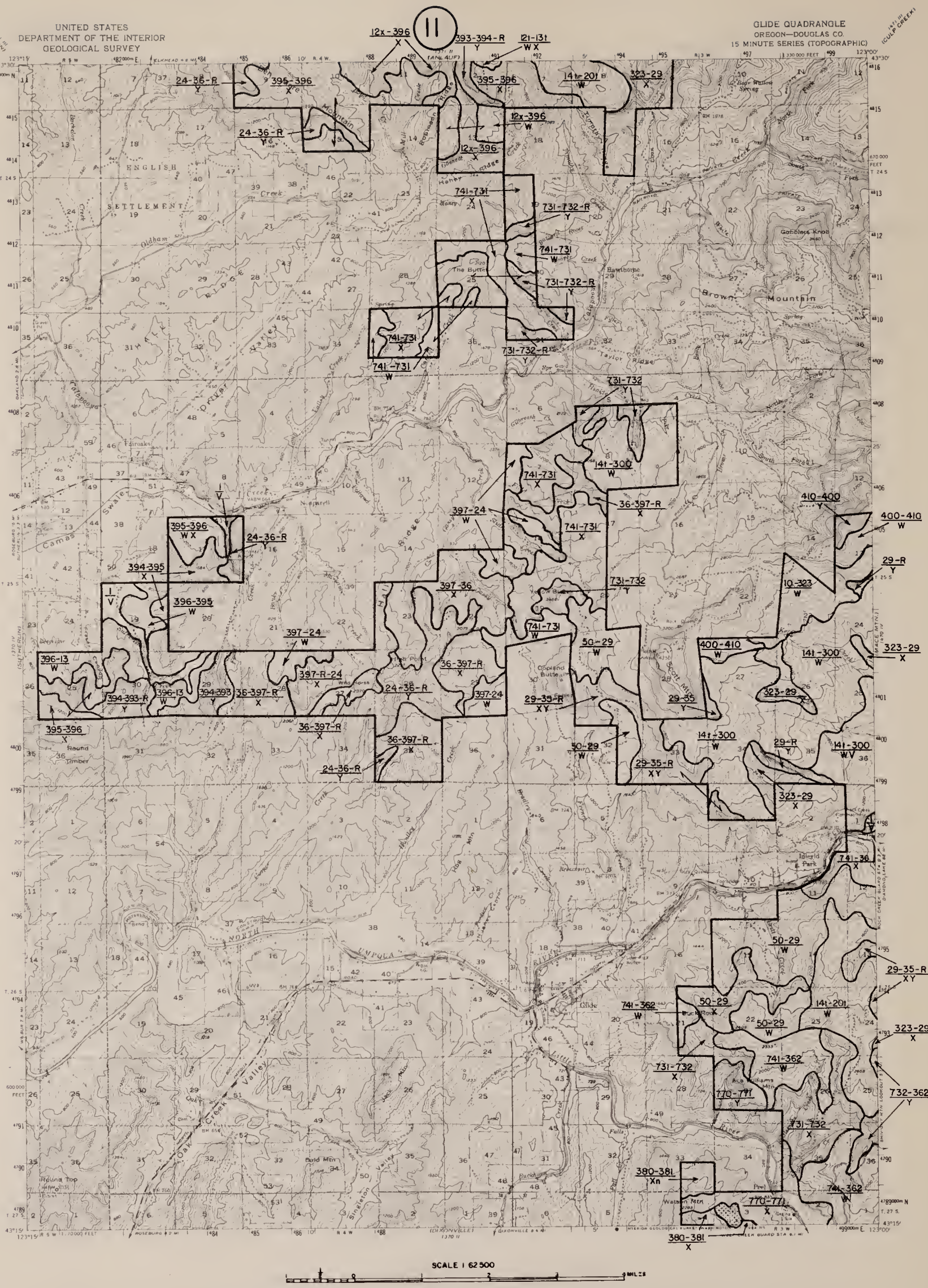
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GLIDE QUADRANGLE
OREGON—DOUGLAS CO.
15 MINUTE SERIES (TOPOGRAPHIC)



U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

12

MACE MTN. QUADRANGLE
OREGON-DOUGLAS CO.
MINUTE SERIES (TOPOGRAPHIC)

SCALE 1 62 500

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ILLAHEE ROCK QUADRANGLE
OREGON
15 MINUTE SERIES (TOPOGRAPHIC)

53-70 Y
400-410 Y
400-410 YX
323-53 YX
53-70 Y
141-300 WX
323-53 YX
400-410 X
70-53-R Y
19-400 WX
141-300 W
29-35 Y
323-29 YX
141-300 X
29-35 Y

U M P Q U A
N A T I O N A L
R A G G E D R I D G E
F O R E S T

SCALE 1 62500

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

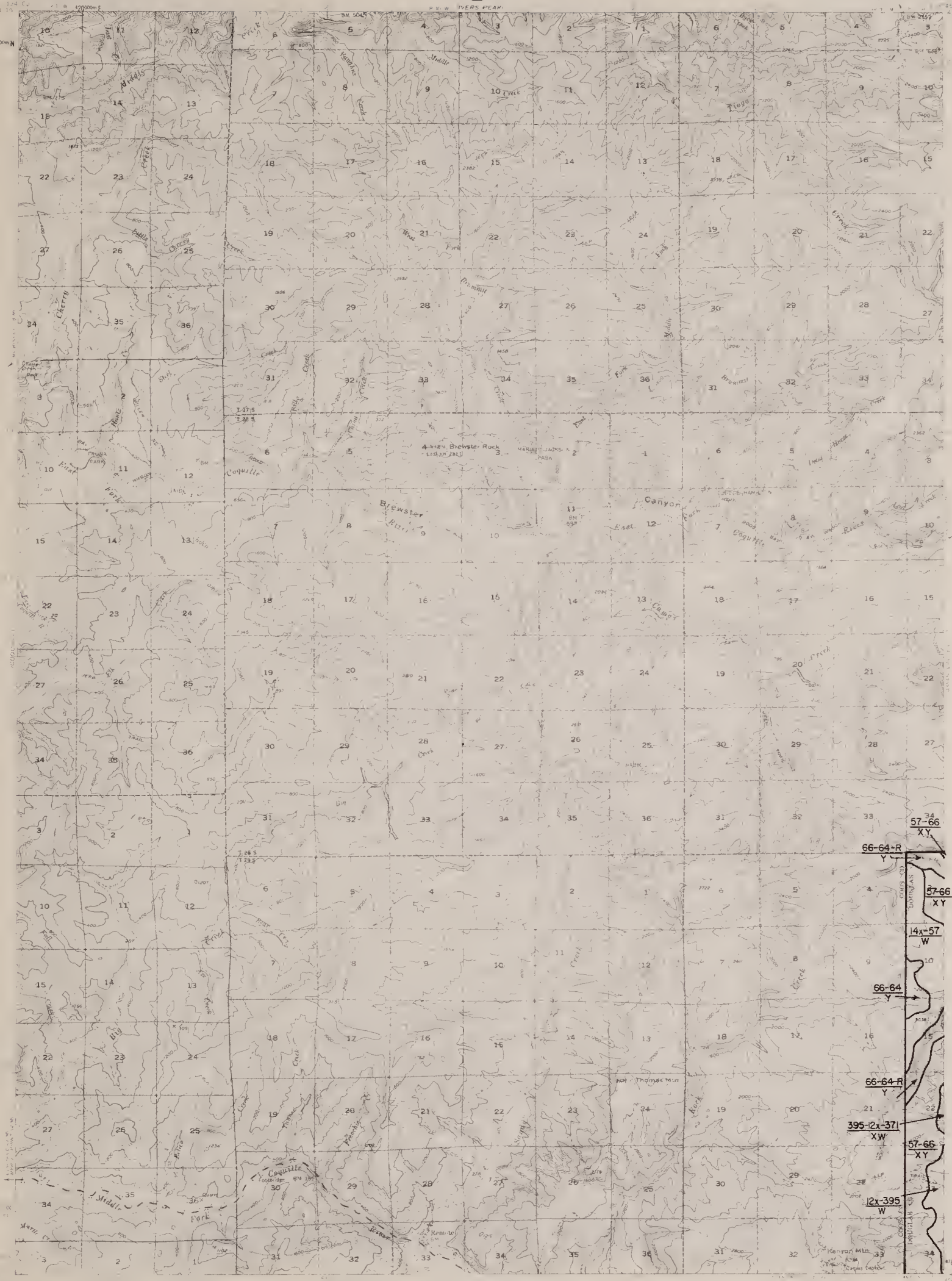
SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

14

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SITKUM QUADRANGLE
OREGON
15 MINUTE SERIES (TOPOGRAPHIC)



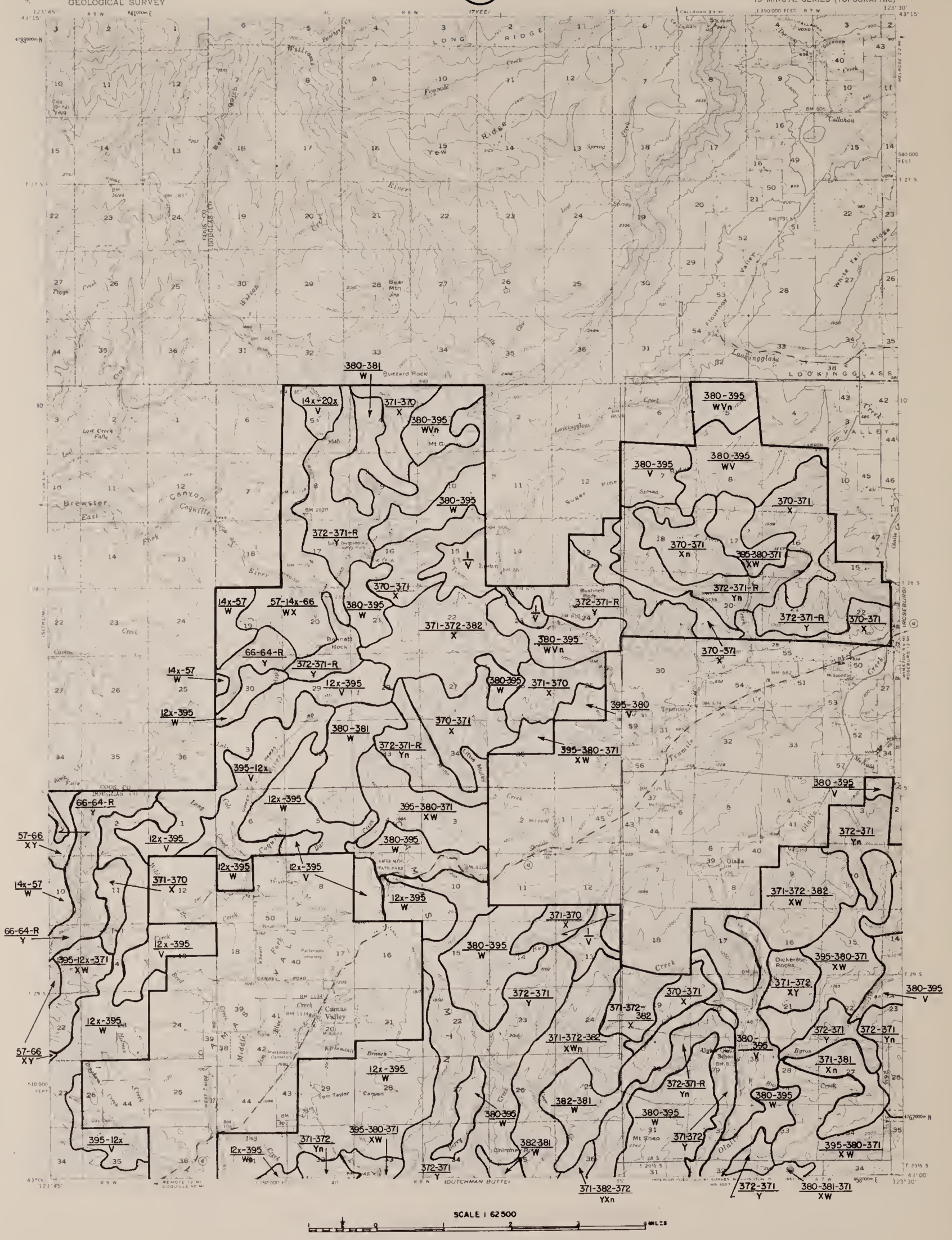
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CAMAS VALLEY QUADRANGLE
OREGON
15 MINUTE SERIES (TOPOGRAPHIC)



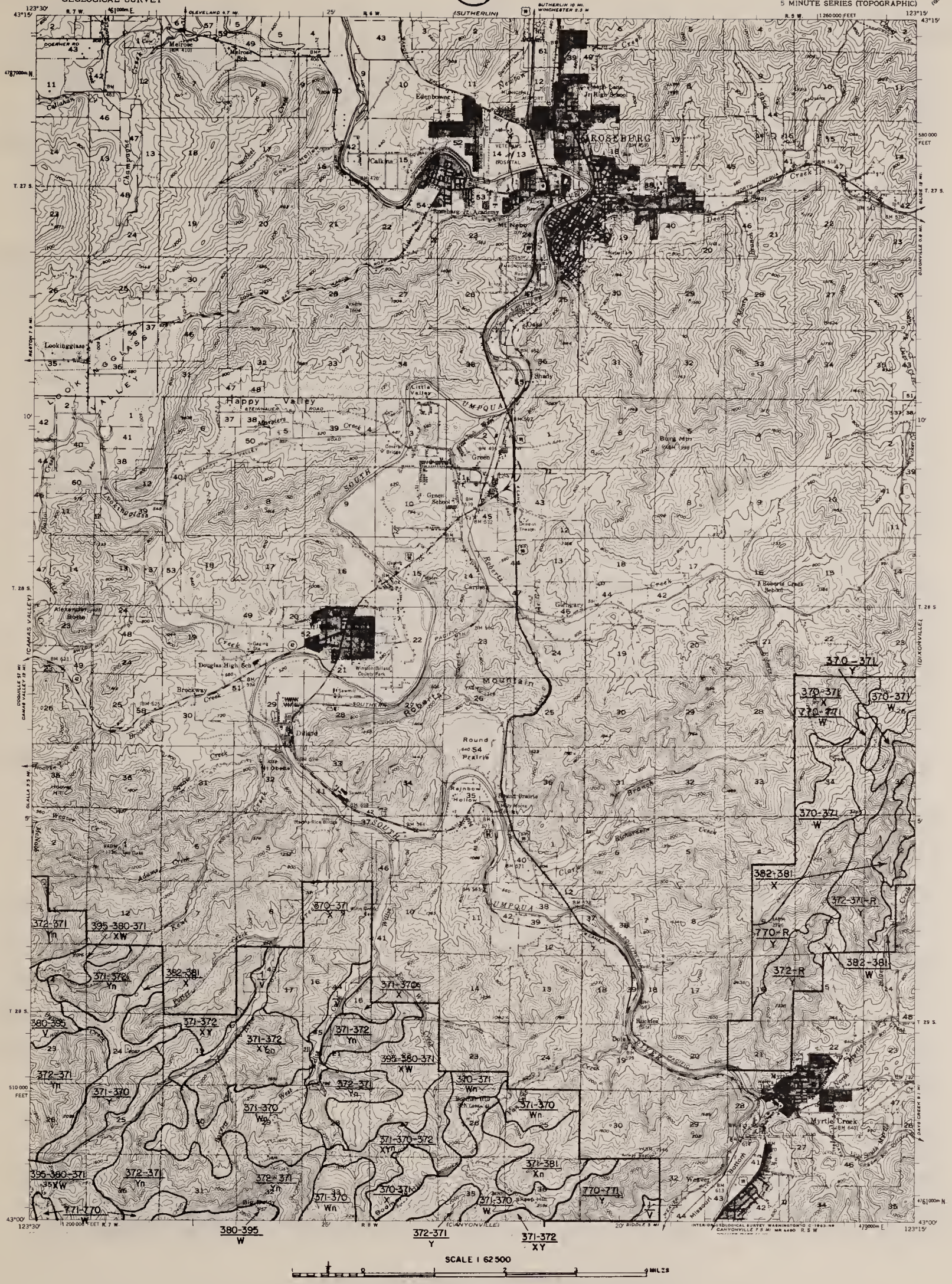
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976
ROSEBURG DISTRICT

16

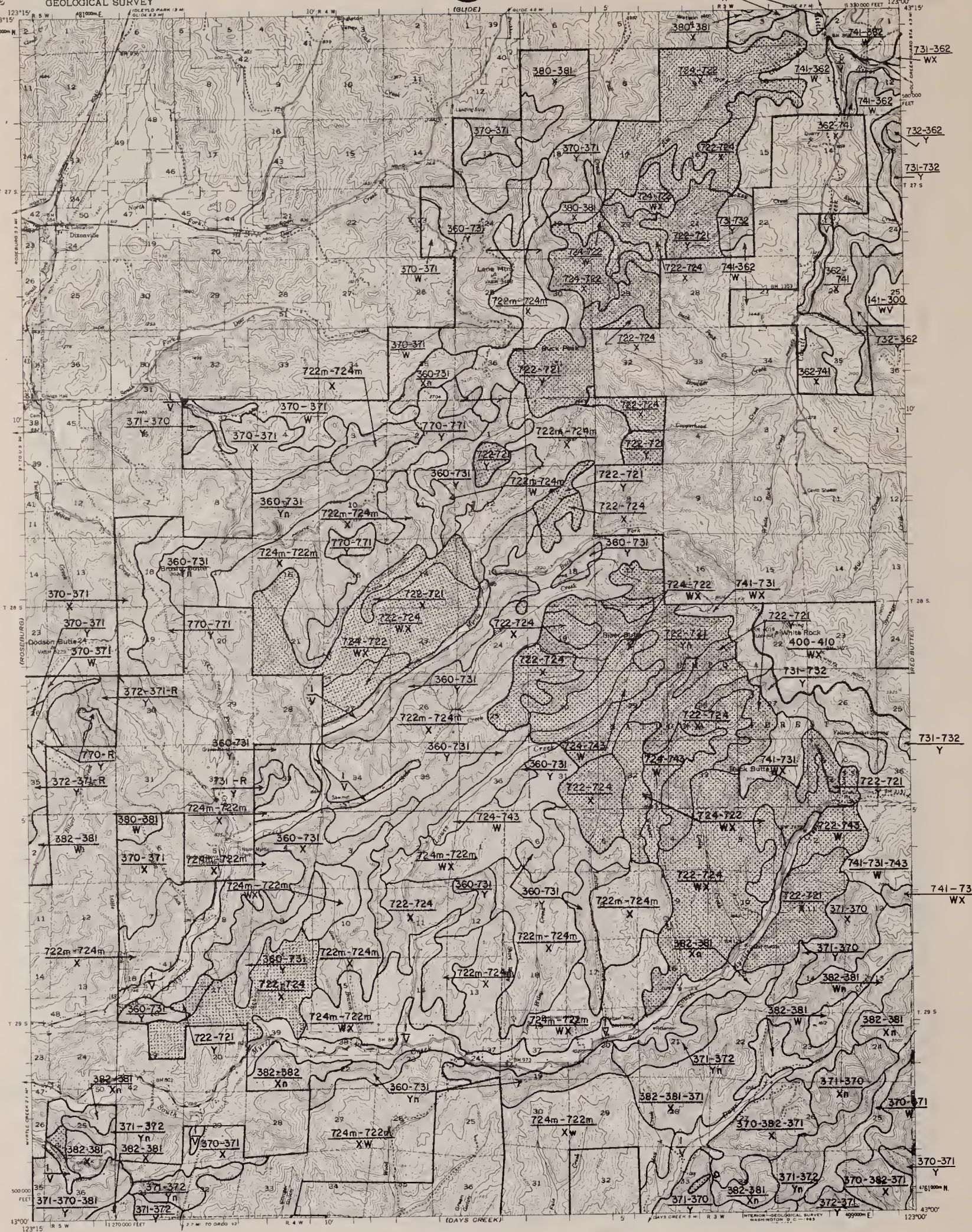
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ROSEBURG QUADRANGLE
OREGON—DOUGLAS CO.
5 MINUTE SERIES (TOPOGRAPHIC)


ROSEBURG
Melrose
Edenbower
Calkins
Looking Glass Valley
Happy Valley
Green
Green School
Douglas High Sch
Dillard
Round Prairie
Rainbow Hollow
Mountain
Myrtle Creek
Burg Mtn
Glenbary
Carlton
Shady
Dole
Riddle
Canyonville
South Umpqua
North Umpqua
Roberts Creek
Brockway Creek
Champagne Creek
Callahan Creek
Looking Glass Creek
Deer Creek
Days Creek
Rice Creek
Richardson Creek
Myrtle Creek
Rosenburg Jr Academy
Mt Nebo
South Umpqua Jr High School
Winston Dillard County Park
Douglas County Radio Tower
Veterans Hospital
Newton Municipal Airport
Pacific Hwy
Southern Pacific
Missouri Bottom
Old Bottom
Sawmill
Covered Bridge
Drive-In Theatre
Rainbow Hollow
Mount Prairie
Hoover Hill
Big Rocky
Alexander Butte
Mt Scott
Mt Nebo
Burg Mtn
Glenbary
Round Prairie
Douglas High Sch
Winston Dillard County Park
Rosenburg Jr Academy
Newton Municipal Airport
Veterans Hospital
Douglas County Radio Tower
South Umpqua Jr High School
Myrtle Creek
Missouri Bottom
Old Bottom
Pacific Hwy
Southern Pacific
Sawmill
Covered Bridge
Drive-In Theatre
Rainbow Hollow
Mount Prairie
Hoover Hill
Big Rocky
Alexander Butte
Mt Scott

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DIXONVILLE QUADRANGLE
OREGON—DOUGLAS CO.
15 MINUTE SERIES (TOPOGRAPHIC)



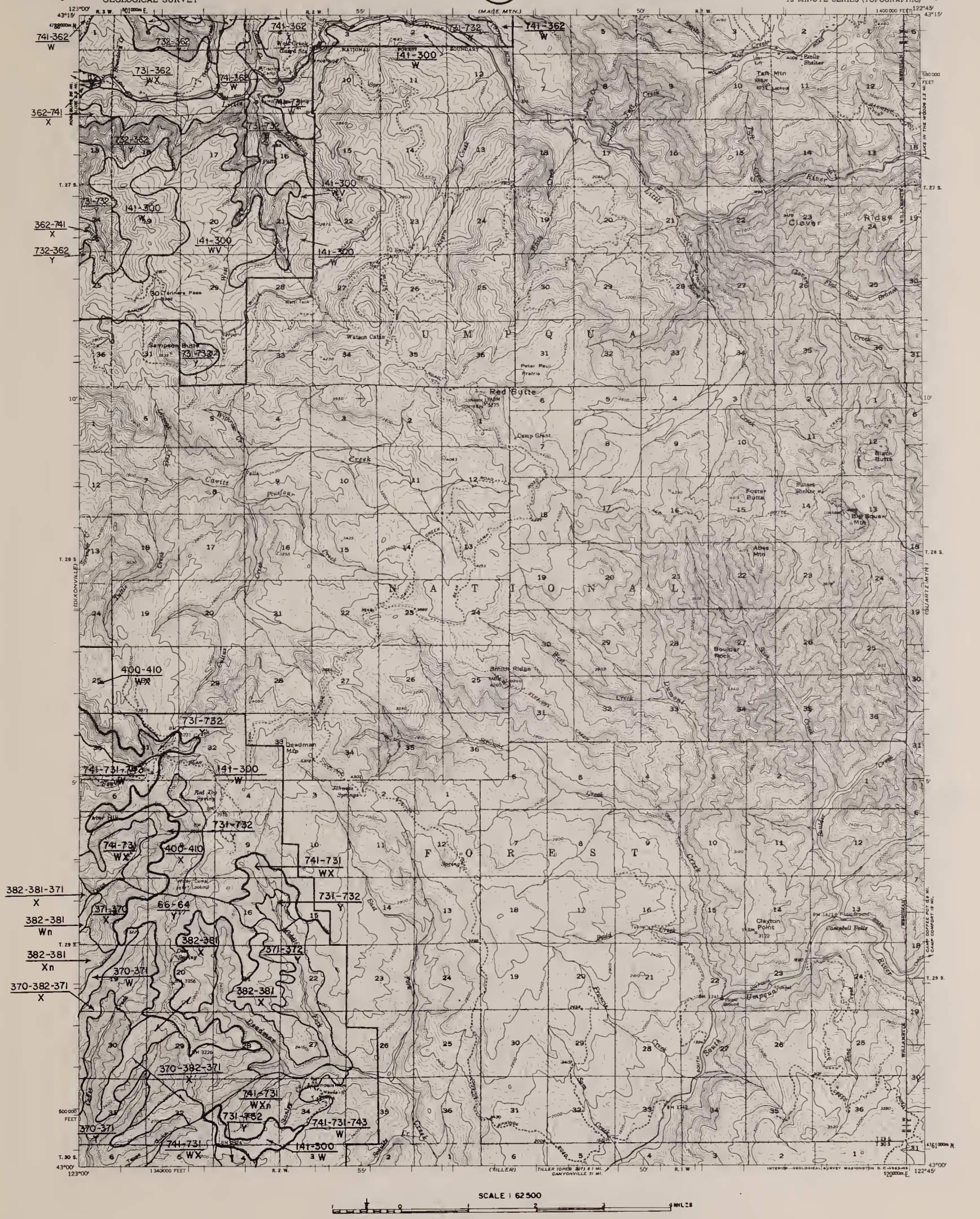
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

RED BUTTE QUADRANGLE
OREGON—DOUGLAS CO.
15 MINUTE SERIES (TOPOGRAPHIC)



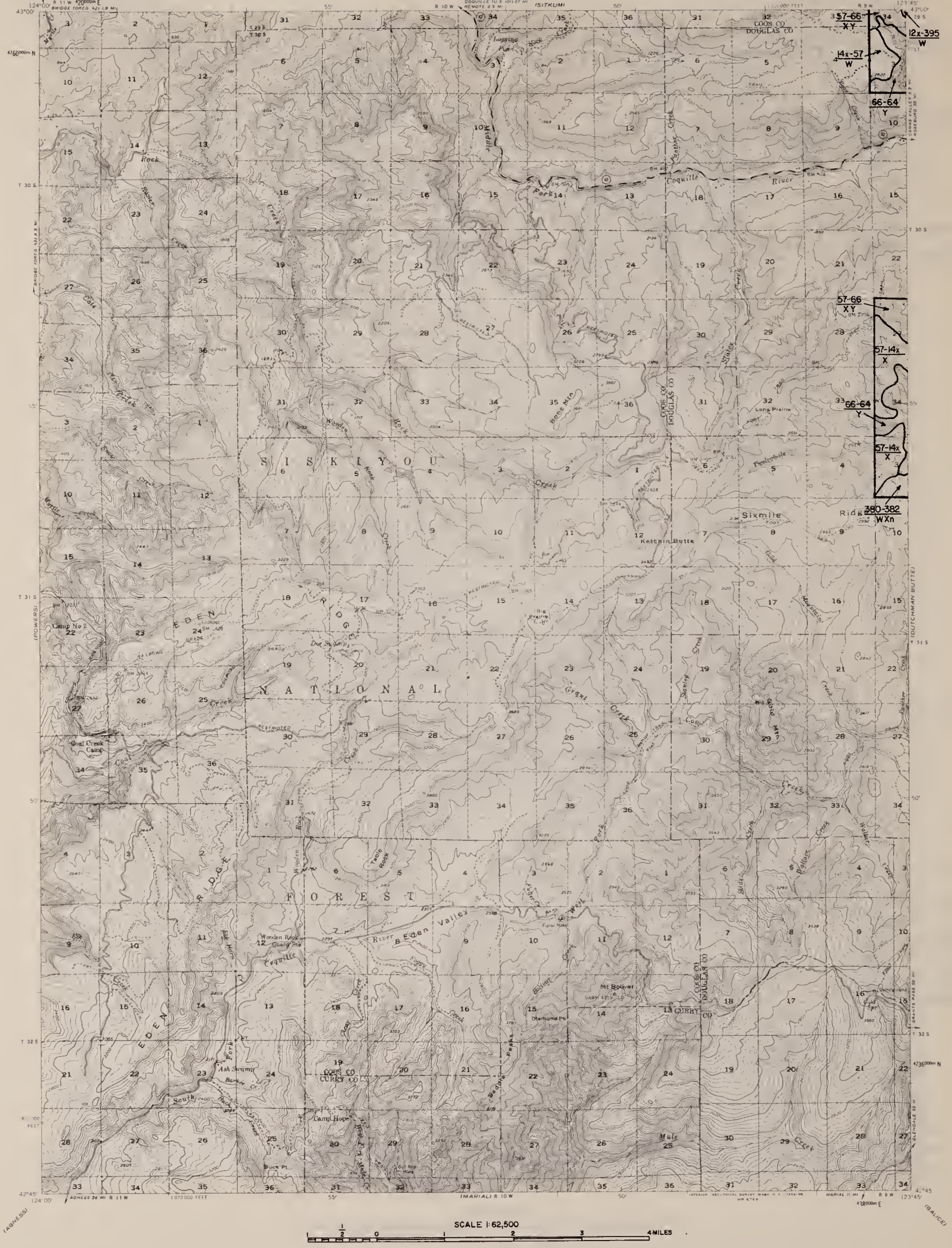
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BONE MOUNTAIN QUADRANGLE
OREGON
15 MINUTE SERIES (TOPOGRAPHIC)



SCALE 1:62,500

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

20

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

OREGON
DUTCHMAN BUTTE QUADRANGLE
15-MINUTE SERIES

SCALE 1 62500

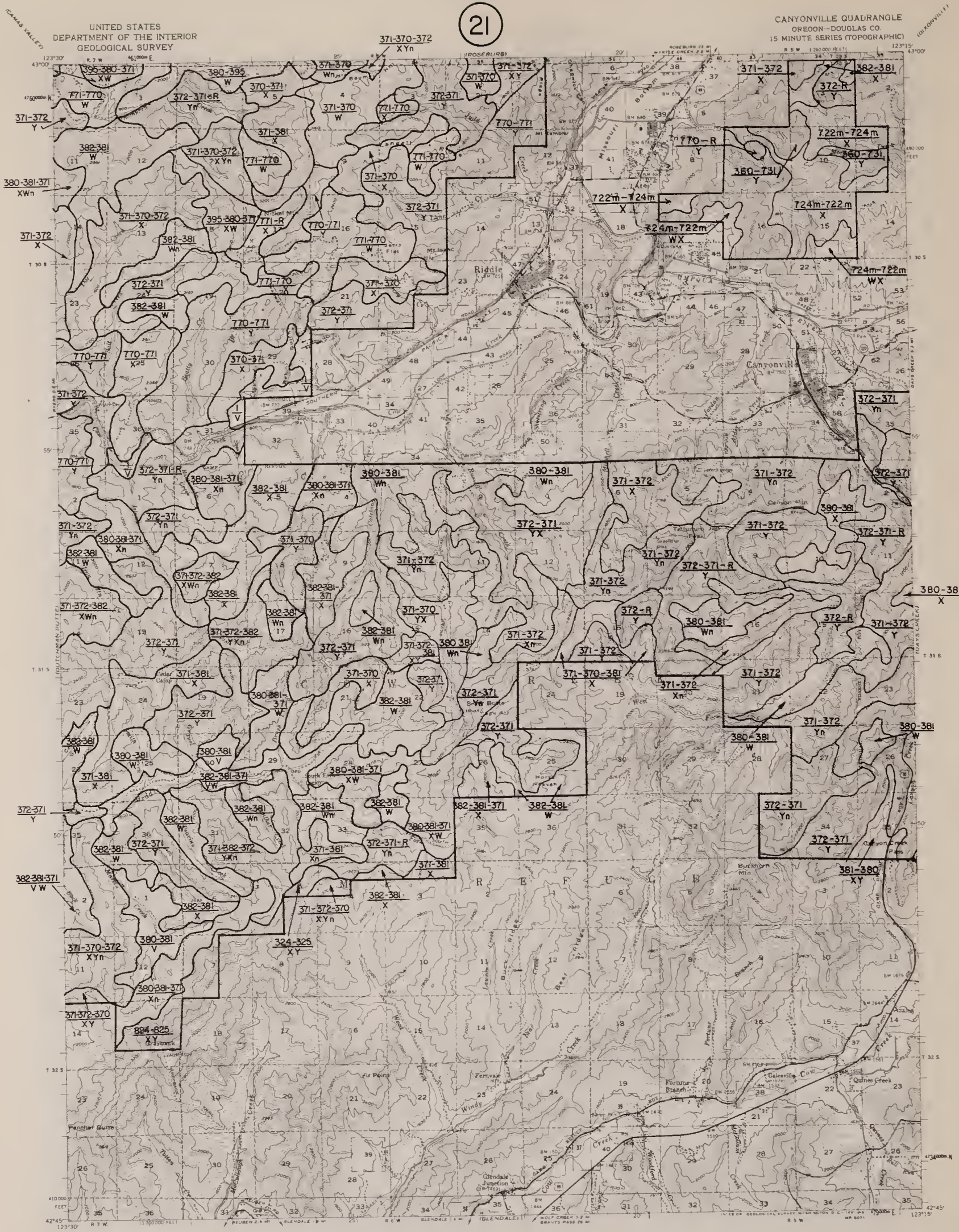
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976
ROSEBURG DISTRICT

21

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

CANYONVILLE QUADRANGLE
OREGON—DOUGLAS CO.
15 MINUTE SERIES (TOPOGRAPHIC)


Riddle
Canyonville
Fir Point
Fernvale
Glendale Junction
Fortune Branch
Galesville Cem
Quines Creek
Panther Butte
Burnham Mtn
Buck Rider Creek
Bear Creek
Windy Creek
Woodford Creek
Jackson Creek
Canyon Creek
Days Creek
Deer Creek
Cow Creek
Tributary
Pass
Ridge
Mt. Isaacs
Mt. Scott
Mt. Bowden
Mt. Nebo
Mt. Gurney
Mt. Lookout
Mt. Nichols
Mt. Wilson
Mt. Mitchell
Mt. Mitchell
Mt. Mitchell

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DAYS CREEK QUADRANGLE
OREGON
15 MINUTE SERIES (TOPOGRAPHIC)

SCALE 1 62 500

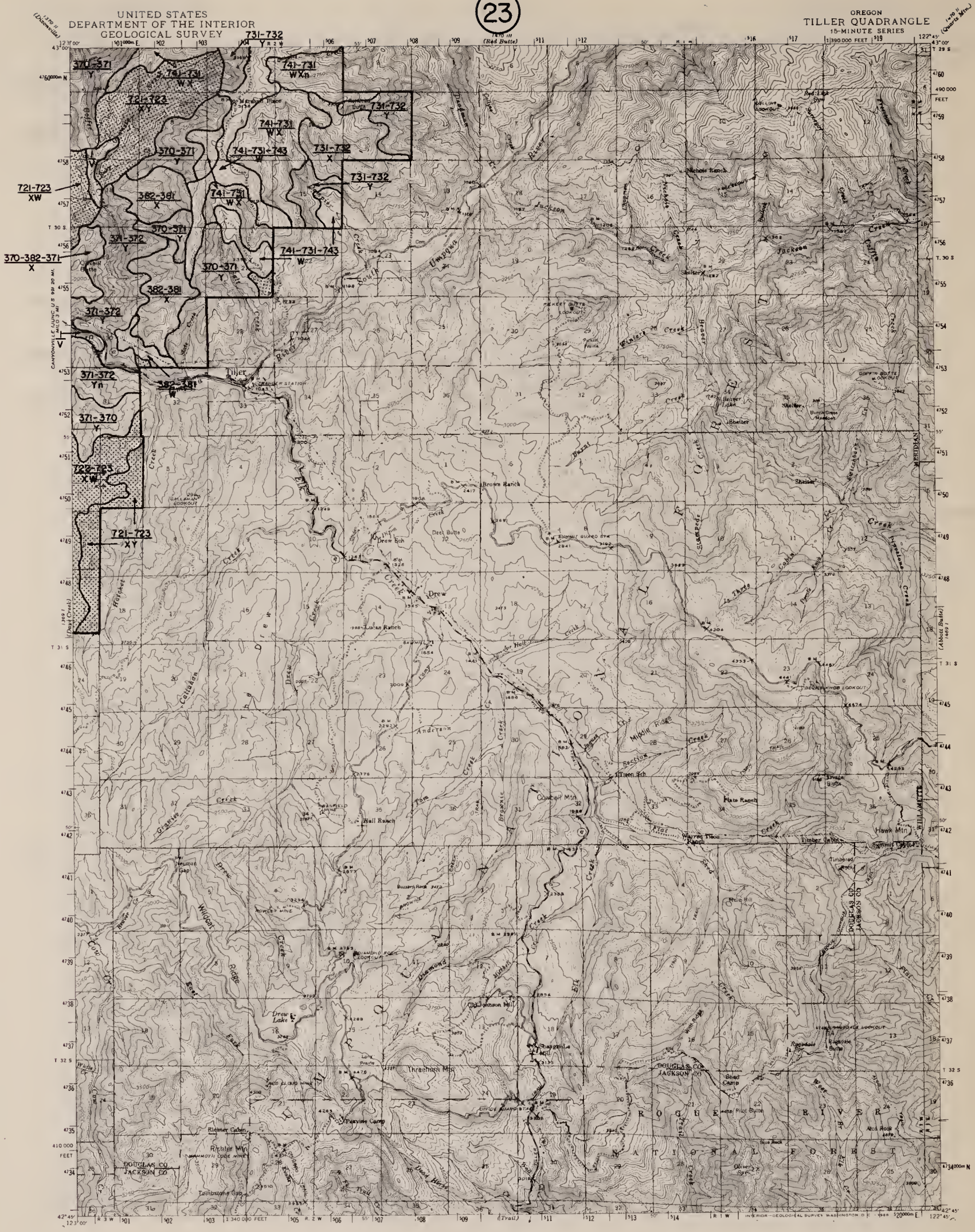
U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

OREGON
TILLER QUADRANGLE
15-MINUTE SERIES



SCALE 1 62500

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
OREGON

SOIL INVENTORY MAP 1976

ROSEBURG DISTRICT

7100
LASO

BUREAU OF LAND MANAGEMENT
333 South Fourth Street
Coos Bay, OR 97420